

# MONTHLY WEATHER REVIEW.

(GENERAL WEATHER SERVICE OF THE UNITED STATES.)

WASHINGTON, D. C., JANUARY, 1882.

*United States* WAR DEPARTMENT,  
OFFICE OF THE CHIEF SIGNAL OFFICER,  
DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

## INTRODUCTION.

In preparing this REVIEW the following data, received up to February 20th, have been used, viz: the regular tri-daily weather charts, containing the data of simultaneous observations taken at 135 Signal Service stations and 13 Canadian stations, as telegraphed to this office; 164 monthly journals and 165 monthly means from the former, and 13 monthly means from the latter; 216 monthly registers from Voluntary Observers; 60 monthly registers from United States Army Post Surgeons; Marine Records; International Simultaneous Observations; Marine Reports through the co-operation of the New York Herald Weather Service; abstracts of Ships' Logs, furnished by the publishers of the New York Maritime Register; monthly reports from the local Weather Services of Iowa, Nebraska and Missouri, and of the Central Pacific Railway Company; reliable newspaper extracts; special reports.

## BAROMETRIC PRESSURE.

To illustrate the subject of the distribution of mean atmospheric pressure over the United States and Canada for the month of January, 1882, chart No. II has been prepared, upon which are traced the lines of equal barometric mean values. The areas of lowest mean pressure embrace the Lake Superior region and the Canadian Maritime Provinces, lowest barometers at Charlottetown, P. E. I., and Marquette, 29.92 and 30.04 respectively. In the extreme southern portion of the South Pacific Coast Region the barometric mean falls to 30.03; elsewhere throughout the entire country the mean pressure ranges from 30.07 to 30.23. The two principal areas of high pressure embrace the South Atlantic States and the Middle Plateau Region, highest barometers, 30.23, at Augusta and Charleston, and 30.21 at Pioche, Salt Lake City and Eagle Rock. By comparison with the previous month, it will be noticed that the areas of maximum pressure occupy about the same regions, the western area decreasing in extent and pressure, while that to the eastward increased in extent but diminished slightly in pressure. The low area which occupied northern Minnesota and Dakota in December last, moved gradually eastward into northern Canada, but the change was not sufficient to restore the natural condition in the former State, as at St. Vincent the barometric mean value still remained 0.06 inch below the normal.

*Departures from the Normal Values for the Month.*—Compared with the means of previous years, the mean pressure for the present month shows (with the exception of scattering stations) very small changes. The distribution of excess and deficiency is evenly balanced in the number of separate areas but not in the extent embraced by each. For the most part, the pressure is below the normal for the month. The larger area of excess embraces the central portion of the Lake Region and

thence southeastward to the Atlantic coast, the departures ranging from 0.01 to 0.1 inch, being mostly however, from 0.02 to 0.05 inch. The second area of excess includes the Middle and Northern Pacific Coast and Northern Plateau Regions, where the departures range from 0.02 inch at Sacramento to 0.14 inch at Portland and Olympia. The most extensive area of deficiency, including the Eastern Gulf States and South Pacific Coast Region, embraces the entire country west of the Mississippi and east of the 112th meridian, the departures ranging from 0.01 to 0.1 inch. The second and smaller area of deficiency comprises the eastern portion of the Lower Lake Region, and New England north of Connecticut, departures ranging from 0.01 to 0.04 inch. Stations reporting a normal condition are as follows: Marquette, New Haven, New London, Pioche and Smithville.

*Barometric Ranges.*—The range of pressure for the present month has generally varied from 0.75 to 1.35 inches, and in the extremes from 0.43 inch at Key West to 1.7 inches at Barnegat. The ranges increase with the latitude throughout the entire country, and along the southern boundary of the United States, from Florida to California. Throughout the various districts the monthly barometric ranges varied as follows: New England, from 1.14 inches on Mt. Washington to 1.56 inches at Eastport and 1.63 inches at Newport; Middle Atlantic States, 1.31 inches at Lynchburg to 1.47 inches at Albany and 1.7 inches at Barnegat; South Atlantic States, 0.79 inch at Jacksonville to 1.36 inches at Kittyhawk; Florida Peninsula, 0.43 inch at Key West to 0.66 inch at Cedar Keys; Eastern Gulf States, 0.65 inch at Pensacola to 0.78 inch at Montgomery and Vicksburg; Western Gulf States, 0.63 inch at Indianola and Galveston to 0.83 inch at Little Rock and 1.03 inches at Fort Gibson; Rio Grande Valley, 0.54 inch at Brownsville to 0.65 inch at Castroville and 0.7 inch at Rio Grande; Ohio Valley and Tennessee, 0.9 inch at Memphis to 1.02 inches at Cincinnati and 1.3 inches at Pittsburg; Lower Lake Region, 1.12 inches at Detroit and Cleveland to 1.45 inches at Oswego; Upper Lake Region, 1.17 inches at Marquette to 1.25 inches at Chicago and 1.47 inches at Alpena; Upper Mississippi Valley, 1.00 inch at Cairo to 1.21 inches at Des Moines and 1.37 inches at Madison; Missouri Valley, 0.97 inch at Springfield, Mo., to 1.11 inches at Yankton and 1.17 inches at Leavenworth and Huron; Extreme Northwest, 1.17 inches at Fort Buford to 1.21 inches at Bismarck and 1.55 inches at St. Vincent; Northern Slope, 0.76 inch at Cheyenne to 1.00 inch at Fort Custer and 1.02 inches at Forts Assinaboine and Benton; Middle Slope, 0.67 inch on Pike's Peak to 1.03 inches at Dodge City; Southern Slope, 0.56 inch at McKavett to 0.59 inch at Fort Davis and 0.98 inch at Fort Griffin; Northern Plateau, 0.74 inch at Eagle Rock to 1.00 inch at Spokane and 1.25 inches at Umatilla; Middle Plateau, 0.69 inch at Pioche to 0.79 inch at Winnemucca and 0.8 inch at Salt Lake City; Southern Plateau, 0.42 inch at Fort Grant to 0.53 inch at Prescott and 0.68 inch at Santa

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Fe; North Pacific Coast Region, 0.81 inch at Roseburg to 0.97 inch at Portland and 1.18 inches at Olympia; Middle Pacific Coast Region, 0.61 inch at San Francisco to 0.67 inch at Sacramento and 0.73 inch at Red Bluff; South Pacific Coast Region, 0.66 inch at Visalia to 0.76 inch at Yuma and 0.8 inch at San Diego.

*Areas of High Barometer.*—Nine such areas have been sufficiently important to merit description.

No. I.—During the 1st the pressure rapidly increased over the Lake Region, Tennessee, the South Atlantic and East Gulf States. The morning map of the 2d showed a centre of high barometer near Montgomery and one in the Extreme Northwest. This increased pressure in the Gulf States extended rapidly to the northeast, following the passage of low area No. I, and on the 3d joined the northern high area, which had moved eastward. On the morning of the 4th the centre of high barometer was near Parry Sound, and during this day and the 5th passed over the St. Lawrence Valley and to the eastward over Nova Scotia. A rapid fall of temperature accompanied the rise in the barometer along the Atlantic coast on the 1st and 2d. The cold wave which accompanied the high barometer that passed from the northwest did not effect stations south of lat. 40° N. The minimum temperature for the month occurred at most stations in the South Atlantic and East Gulf States on the 2d.

No. II.—During the 6th the barometer rose rapidly in Oregon and Washington Territory. This rise extended, during the 7th, over the whole country west of the Mississippi, and on the 8th the area of highest barometer was over Colorado and Kansas; it then moved into the Ohio valley and the Lower Lake Region, and thence off to the northeast. The cold wave accompanying this area was felt on the Pacific coast on the 6th, extended to the Missouri river on the 7th, and reached the Atlantic coast on the 9th. The temperature continued to fall along the Atlantic coast during the 10th.

No. III.—Appeared in Montana on the 9th, moved to the southeast during the 10th, and on the morning of the 11th was central in Kansas; in Pennsylvania on the morning of the 12th, and passed off the Middle Atlantic coast during the day. The cold wave reached the Mississippi on the 10th. From the afternoon of the 10th to the afternoon of the 11th the temperature fell from 15° to 23° in the East Gulf States, and the morning map of the 12th showed a fall of from 13° to 24° in the Upper Lakes in last 24 hours.

No. IV.—Appeared in Washington Territory on the 12th; the increased pressure extended rapidly to the southeast. On the 13th the centre of high pressure was in Kansas, and moved during the 14th to the South Atlantic coast. The temperature fell from 8° to 27° in Dakota and Montana during the 12th; this fall of temperature was felt over the Mississippi and Missouri Valleys and West Gulf States during the 13th, and over New England, the Middle and South Atlantic States on the 14th. During the 15th the pressure fell rapidly in the Lower Lake Region and New England, and remained comparatively high in the South. The winds shifted to southerly, and the temperature rose from 10° to 20° in the Lower Lakes, in New England, the Middle, South Atlantic and Gulf States.

No. V.—The barometer rose rapidly in Montana on the 14th, and on the 15th the highest pressure was over that Territory; by the 16th it had moved into Kansas; the centre thence passed eastward to the Middle Atlantic coast and up the coast to Nova Scotia. The cold wave was felt over the whole United States. Starting in Montana on the 14th, it soon extended from British America to the Gulf of Mexico, and passed eastward, reaching the Atlantic coast on the 17th. From the morning of the 16th to the morning of the 17th the temperature fell 44° at Denison, 36° at Indianola, from 35° to 40° in the Ohio Valley and from 20° to 36° in the Middle Atlantic States, and New England on the 17th.

No. VI.—An area of high barometer that had advanced from the Northwest was found on the morning of the 19th as an area of 30.30 over Missouri, Iowa and Illinois. The centre of

high pressure moved rapidly to the northeast, and on the morning of the 20th the highest pressure was over Nova Scotia. During the night of the 17th the temperature fell from 15° to 25° in Dakota and Montana, and from 6° to 14° in the Upper Lake Region the next night. No marked changes were observed in the Lower Lake Region. The cold wave reached the Atlantic coast on the afternoon and night of the 19th, causing a fall of from 10° to 20° in the Middle Atlantic and New England States, and Canadian Maritime Provinces.

No. VII.—On the morning of the 21st the highest barometer was in northwestern Dakota, where the pressure had increased from 0.68 to 0.76 inch in last twenty-four hours. On the morning of the 22d the area of highest pressure was over Manitoba; it reached the St. Lawrence Valley on the 24th, and then moved to the southeast, and on the morning of the 25th was over the New England coast. The winds shifted to the northwest in the Upper Lake Region on the 21st, the Lower Lakes and Middle Atlantic States on the 22d, and in New England on the 23d. Snow fell in the Lake Region on the 21st, 22d, and 23d. In New England and the Middle Atlantic States the weather generally cleared as soon as the wind had shifted to northwest. In its progress this area was accompanied by very low temperatures. The minimum temperatures for the month occurred at most stations in the Lake Region, New England and Middle Atlantic States on the 24th.

No. VIII.—The barometer rose from 0.38 inch to 0.46 inch in Montana on the 25th. This increased pressure extended rapidly to the south and east, and at midnight of the 26th the highest barometer was at Leavenworth. The centre of highest pressure then passed rapidly to the Lower Lake Region, and thence to the northeast over the Canadian Maritime Provinces. At midnight of the 25th the temperature had fallen from 20° to 30° in Montana in last twenty-four hours. The cold wave extended south to Mexico; it then moved eastward reaching the Atlantic coast on the 27th.

No. IX.—On the morning of the 28th an area of high barometer was central in the Upper Missouri Valley, and a marked fall in temperature occurred in the Upper Mississippi and Missouri Valleys and northwest districts. This high barometer moved down the Missouri Valley. The highest barometer was at Leavenworth on the morning of the 29th. It then moved east to the Atlantic coast, which it reached on the 30th. A marked fall in temperature was felt in all districts. As this area passed over the Upper Missouri Valley the minimum temperatures for the month occurred on the 28th.

*Areas of Low Barometer.*—Fourteen areas of barometric minima appeared within the limits of the Signal Service stations during the month of January, 1882. Chart No. I shows the paths of thirteen of these areas. No. VIII is not charted.

No. I.—On the 30th of December, 1881, the barometer fell rapidly in Texas. This fall extended eastward the next day, and at midnight of the 31st a storm centre was located in northeastern Georgia. The morning map of January 1st showed the centre to be near Smithville, N. C. It then passed to the northeast, accompanied by high winds, heavy rain and snow along the Atlantic coast. Snow also fell in the Lake Region. The following high velocities were noted during the passage of this storm: Hatteras, NW., 32 miles; Kittyhawk, N., 48 miles; Cape Henry, NW., 52 miles; Delaware Breakwater and Sandy Hook, N., 43 miles. The following reports furnished through the co-operation of the New York Herald Weather Service probably indicates the presence of this storm during its passage eastward over the ocean: S. S. *Assyria*, 1st, a. m., in 35° 21' N., 66° 10' W., 30.20, W., force 6, clear and fine; p. m., in 35° 42' N., 67° 28' W., 29.88, SSE., force 8, overcast and threatening. 2d, in 36° 13' N., 68° 13' W., 29.90, W., force 9, heavy squalls, thunder and lightning; p. m., in 36° 26' N., 69° 07' W., 29.90, force 8, overcast and squally, high confused sea. 3d, a. m., in 37° 32' N., 70° 35' W., 30.10, WNW., force 6, sea covered with driving vapour of warm water followed by squally weather and hail. S. S. *Acapulco*, 1st, in 34° N., 74° 18' W., 29.82, a fall of 0.42 inch in past 24 hours,



WSW., force 9, heavy squalls of wind and rain. 2d, in 37° 20' N., 73° 48' W., 30.25, NNW., force, 6, snow squalls, heavy sea swell from northeast.

No. II.—Appeared in Texas on the 3d. It moved to the northeast with increasing pressure, during the 4th, and disappeared as a storm centre on the 5th, in Ohio. Rain fell in the Gulf States and Tennessee, and snow in the Ohio Valley and Lake Region.

Nos. III and IV.—No III appeared on the coast of Washington Ter., on the morning of the 4th. On the 5th, it was near Fort Garry, southeast to southwest winds, with cloudy weather, prevailing in the Lake Region and the Upper Mississippi and Missouri Valleys. On the 6th it rained or snowed in all districts east of the Mississippi river. On the 7th the centre passed to the east of Nova Scotia. On the morning of this day area No. IV appeared in Iowa, and the rains of the 6th continued during the 7th and 8th. This area moved north and east and disappeared over the Gulf of St. Lawrence on the afternoon of the 9th. The following reports furnished through the co-operation of the New York Herald Weather Service, probably indicates the presence of this storm during its passage eastward over the ocean: S.S. *Zeeland*, 7th, in 42° 11' N., 61° 19' W., 29.50, a fall of 0.65 inch in past 24 hours, variable winds; 8th, in 41° 13' N., 64° 48' W., 29.95, NNW., moderate gale, high westerly sea; 9th, in 40° 47' N., 69° 46' W., 29.62, SW., fresh gale, dense fog for seven hours. S. S. *Celtic*, in 42° 24' N., 61° 02' W., 29.85, a fall of 0.51 inch in past 24 hours, S., force 4, rain.

No. V.—On the morning of the 10th this area was central in Texas, accompanied by rain in the North Atlantic and Gulf States, Tennessee and the Ohio Valley. This storm moved rapidly to the Lower Lake Region and thence to the northeast. General and heavy rains in all districts east of the Mississippi, clearing in New England on the 12th, and in other districts the day before. Wind velocities of 27 to 40 miles were reported from the New England, Middle, and South Atlantic coasts. The following reports furnished through the co-operation of the New York Herald Weather Service probably indicates the presence of this storm during its passage eastward over the ocean: S. S. *City of Montreal*, 12th, in 44° 31' N., 49° 56' W., NW. to NE. strong gales, high head sea; 13th, in 43° 06' N., 56° 01' W., E. to NNW., strong gales, heavy snow squalls, high beam sea.

No. VI.—Advancing from the southwest this area was central near Leavenworth at midnight of the 12th. Rain had fallen during the day in all districts east of the Mississippi; these rains continued during the 13th. The winds had shifted to westerly and by midnight of the 14th clear weather prevailed in nearly all districts. On the afternoon of the 15th a new area (No. VIII, not charted) appeared near Leavenworth, and following after No. VI caused general and heavy rain or snow in the same districts as No. VI. The rain continued in New England, the Middle, South Atlantic, and Gulf States, Tennessee and the Ohio Valley, and Lower Lake Region until the 17th. The following reports furnished through the co-operation of the New York Herald Weather Service probably indicates the presence of this storm during its passage eastward over the ocean: S. S. *City of Montreal*, 14th, in 42° 12' N., 61° 18' W., NNW. to S. and NW., fresh to strong gales, high head sea; 15th, in 41° 01' N., 65° 17' W., WNW., heavy gale, high head sea; 16th, in 40° 40' N., 71° 11' W., strong westerly winds, fine weather. S. S. *Britannic*, 14th, in 42° 02' N., 62° 42' W., 29.13, a fall of 0.67 inch in past 24 hours, W., force 6; 15th, in 40° 46' N., 69° W., 29.91, WSW., force 3.

No. VII.—This area could only be approximately traced, as its path was north of our stations of observation; it was of slight energy, and had but little effect on the weather in the United States.

No. IX.—Was central near Fort Garry on the afternoon of the 17th. During the remainder of this day and the 18th it moved eastward as far as Rockliffe, accompanied by very little rain, the winds in the Lake Region and Mississippi Valley be-

ing from southwest to northwest. A secondary depression that had moved up from the Gulf of Mexico on the 18th caused rain in the Middle and South Atlantic States and Tennessee. By the morning of the 19th this secondary depression had moved into New England and joined No. IX, which was then central in the St. Lawrence Valley, and at midnight generally fair weather prevailed. The following reports, furnished through the co-operation of the New York Herald Weather Service, probably indicates the presence of this storm during its passage eastward over the ocean: S. S. *Adriatic*, 19th, in 43° 04' N., 57° 55' W., north to variable, fresh gales, snow squalls; 20th, in 41° 30' N., 64° 34' W., variable winds, squally with hail. S. S. *Waceland*, 19th, in 42° 28' N., 60° 05' W., 29.94, a fall of 0.18 inch in past 24 hours, NW. to S., strong winds with thick weather; 20th, in 41° 01' N., 65° 11' W., 30.28, SW. to NE., first part of day stormy with very high sea, followed during afternoon by pleasant weather.

No. X.—Appeared in the Extreme Northwest on the morning of the 20th. On the morning of the 21st the centre was near Marquette, and snow had fallen in the Lake Region. During this day and the 22d it moved east and north to the St. Lawrence Valley, accompanied by snow. The weather generally cleared on the 23d. The following reports furnished through the co-operation of the New York Herald Weather Service probably indicates the presence of this storm during its passage eastward over the ocean: S. S. *Lake Champlain*, 22d, noon, in 43° 30' N., 55° 49' W., 29.38, a fall of 1.00 inch in past 24 hours, SSW., force 4, heavy southerly sea; midnight, barometer 29.40, wind SW, force 9. 23d, noon, in 42° 57' N., 58° 47' W., 29.40, W., force 9, high confused sea; midnight, 29.77, W., force 10. 24th, noon, in 42° 18' N., 61° 09' W., 30.00, WNW., force 9; midnight, 30.40, NW., force 5. S. S. *Bothnia*, in 43° 04' N., 54° 50' W., 29.56, a fall of 0.80 inch in past 24 hours, S., force 6, thick misty weather. 23d, in 42° 04' N., 59° 38' W., 29.57, W., force 11, (violent hurricane) very high westerly sea, dark cloudy sky with heavy hail squalls. 24th, in 41° 10' N., 63° 25' W., 30.14, NW., force 8, very high sea, cloudy with constant snow squalls. 25th, in 40° 42' N., 68° W., 30.50, W., force 3, fine clear weather.

Nos. XI and XII.—No. XI appeared in Montana on the 24th. Rain and snow fell in the Upper Mississippi and Missouri Valleys and the Extreme Northwest on this day. On the 25th the centre moved into the Lake Region and general and heavy rains occurred in all districts east of the Mississippi. The centre passed over New Brunswick on the 26th. On the morning of this day when the centre was near Rockliffe, No. XII appeared central in Iowa, and moved across the Lake Region and into the Province of Ontario. The rains which began with No. XI, continued during the passage of this storm on the 26th. The following reports furnished through the co-operation of the New York Herald Weather Service probably indicate the presence of this storm during its passage eastward over the ocean: S. S. *Republic*, 29th, in 49° 34' N., 37° 55' W., 28.89, a fall of 1.17 inches in past 24 hours, SSW., force 7; 30th, in 48° 15' N., 42° 54' W., 29.22, SSE., force 6, sleeting; 31st, in 46° 33' N., 47° 31' W., 29.59, WSW., force 7, hazy.

No. XIII.—The centre of this area was first located near Duluth, on the midnight map of the 27th. Cloudy weather and light rain in the Lake Region, and general rains and snow in New England prevailed on the 28th. By the morning of the 29th the winds had shifted to west and northwest. Snow fell during the day in New England and the Lower Lake Region; weather generally clearing by midnight.

No. XIV.—This storm moved up from the Gulf of Mexico on the 30th, causing heavy rains in the South Atlantic and Gulf States during the day. On the morning of the 31st it appeared as an area of low barometer, central in Kentucky and snow had fallen in the Middle Atlantic States; this snow continued and extended to New England on the 31st; the weather cleared in the South Atlantic and Gulf States on this date. Cautionary signals were ordered for this storm on the morning of the

31st and were justified by the following maximum velocities: Hatteras, SW., 42 miles; Kittyhawk, S., 36 miles; Cape Henry, E., 36 miles; Delaware Breakwater, E., 40 miles; Sandy Hook, E., 54 miles; New York, NE., 41 miles; Eastport, NE., 38 miles; and by velocities of more than 25 miles at a large number of other stations on the coast. The following reports furnished through the co-operation of the New York Herald Weather Service probably indicate the presence of this storm during its passage eastward over the ocean: *S. SWyoming*, 30th, in 44° 44' N., 54° W., SE. to NW., moderate breeze to hard gale, with frequent snow squalls; 31st, in 43° 12' N., 57° 33' W., NW., fresh to strong gale and squally, high sea; Feb. 1st, in 42° N., 63° 35' W., SE. to NW., strong gales, cloudy with heavy rain; 2d, in 40° 38' N., 69° 37' W., N. to W., heavy gale, with moderate breeze, fine weather.

#### INTERNATIONAL METEOROLOGY.

International charts Nos. IV and V accompany the present REVIEW for January, 1882. The former is published for November, 1879, and continues the series of this chart commenced in January, 1877. The "Beobachtungen auf dem Nordatlantischen Ocean" kindly furnished this office through the courtesy of Prof. Dr. G. Neumayer, Director of the German Marine Observatory, has not been used in the preparation of chart No. IV, owing to unavoidable delay in the receipt of the data. Chart No. V is prepared for the month of February, 1880, and continues the series of this chart commenced in November, 1877.

Chart No. IV shows the mean pressure, temperature and prevailing direction of the wind at 7.35 a. m., Washington, or 0.43 p. m., Greenwich mean time, for the month of November, 1879, over the Northern, and at certain isolated stations in the Southern Hemisphere. There are no marked centres of barometric minima for the present month, owing to a more uniform distribution of mean atmospheric pressure, particularly over the land areas. Three areas of comparatively low pressure are distributed as follows: one between the Azores and Madeira Islands, barometer 29.90; another over the Okhotsk Sea, barometer 29.90, and the last central over Greenland, the isobar of 29.80 passing thence northeastward north of parallel 70° N. to northern Scandinavia and Lapland. The continued progress of areas of high pressure from the region of the Azores northeastward over northern Europe effected a very marked change in the distribution of mean atmospheric pressure off the western coast of that country. The unvarying conditions of the past six months or more have finally been reversed by the formation of an area of barometric maxima over the British Isles and one of barometric minima over the Azores. There are four principal areas of high pressure for the month distributed as follows: in central Mexico, 30.30; off the western coast of Ireland, 30.30; in southeastern Siberia, 30.30; in the southeastern portion of the United States, 30.20. The extreme mean pressures for the month are, 29.71 (lowest) at Gothaab and 30.34 (highest) at Mexico. The extreme monthly range of mean pressure is 0.63 inch, which is 0.63 inch smaller than the range for November, 1877, and 0.68 inch smaller than for the same month in 1878. The following extreme monthly mean temperatures are given in Fahrenheit's scale: *Lowest*, York Factory, 3°; Nertchinsk, 8°; Yeniseisk, 9°; Nikolaievsk, on the Amoor, 13°; Archangel and Barnaul, 14°; Fort Garry and Haparanda, 15°; Moose Factory, 18°; Ekaterinburg, 19°; *Highest*, Free Town, 86°; Paramaribo, 83°; Manilla, 81°; Bridgetown, 80°; Poona, 79°; Bombay, Fort de France, Mauritius, and St. Thomas, 78°; Nassau and Santiago de Cuba, 76°; Havana, 75°. The prevailing direction of the winds over the United States, was *northeast to northwest* in the Atlantic coast States; *southerly* in the Gulf States, Ohio Valley and Tennessee; *southwest to northwest* in the Lake Region; *northwesterly* in the Upper Mississippi and Missouri Valleys and Northwest; *variable* in the Plateau and Pacific Coast Regions. Over Canada and in the Maritime Provinces, *north to west*. In central Mexico, *calms*. Over the Atlantic Ocean,

*northeasterly* from the European coast westward to near 40° W. and from the American coast eastward to same parallel, *north-east to northwest and southwest*. In Europe, *northeast to northwest*, except *southerly* along the Norway coast and in central Russia. In Algiers, *northeast to northwest*. In Hindostan, *northerly*. Along the Asiatic coast and over the Japan Islands, *northeasterly*. Compared with November, 1877 and 1878, the temperature over the United States is generally lower except in the Gulf and South Atlantic States where the isotherm of 60° nearly replaces that of 50° in the two previous years. In barometer there is a marked rise in the Gulf and South Atlantic States, an area of 30.20 replacing that of 30.10; elsewhere there is but little change. Over the Atlantic the change in pressure is a very marked one, particularly in that region included between the parallels of 45° and 65° N. and the meridians of 10° and 35° W. where, as compared with November, 1877, the isobar of 30.30 replaces that of 29.40, and as compared with November, 1878, it replaces that of 29.90. In the region of the Azores there is a decided fall, amounting to over 0.2 inch, while off the American coast in the vicinity of 35° N., 70° W. a very noticeable rise occurs. With respect to temperature there is a general rise north of parallel 40°, increasing slightly with the latitude; elsewhere the changes are unimportant. In the various countries of Europe and Asia, the following changes appear: British Isles, temperature slightly lower and the pressure from 0.45 to 0.73 inch higher. Scandinavia and Denmark, temperature from 5° to 12° lower and the pressure from 0.20 to 0.35 inch higher. France, temperature from 1° to 7° lower and the pressure from 0.28 to 0.33 inch higher. Germany, temperature from 5° to 7° lower and the pressure from 0.20 to 0.25 inch higher. Austria, temperature from 7° to 14° lower and the pressure from 0.05 to 0.07 inch higher. Spain and Portugal, temperature from 4° to 6° higher with an increase in pressure of from 0.01 to 0.04 inch. Italy, temperature from 1° to 3° lower and the pressure from 0.01 to 0.07 inch higher. Algeria, temperature from 1° to 7° higher with an increase in pressure of 0.05 to 0.12 inch. Turkey, temperature slightly higher and the pressure from 0.01 to 0.05 inch lower. British India, temperature from 1° to 4° lower while the pressure shows little or no change. Russia and Siberia, temperature from 1° to 5° lower and the pressure from 0.01 to 0.04 inch higher. The accompanying table shows the deviations in temperature and barometer at isolated stations for the month of November, 1879, as compared with the means of the past two years:

Comparative Thermometric and Barometric Means, with corresponding Departures.

STATION.	Mean Temperature.			Mean Barometer.		
	Nov., 1877-78.	Nov., 1879.	Departure.	Nov., 1877-78.	Nov., 1879.	Departure.
York Factory.....	15.0	2.9	+12.1	29.95	30.11	+0.16
Godthaab.....	28.0	26.8	-1.2	29.73	29.71	-0.02
Stykkisholm.....	31.0	37.0	+6.0	29.68	29.96	+0.28
Tromsø.....	32.2	28.9	-3.3	29.51	29.76	+0.25
Thorshavn.....	39.4	41.5	+2.1	29.55	30.13	+0.58
Archangel.....	31.3	14.0	-17.3	29.76	29.84	+0.08
Ekaterinburg.....	29.1	19.0	-10.1	30.18	30.02	-0.16
Barnaul.....	21.0	14.4	-6.6	30.38	30.22	-0.14
Yeniseisk.....	11.3	9.3	-2.0	30.31	30.19	-0.12
Nikolaievsk on the Amoor.....	6.9	13.3	+6.4	30.32	30.23	-0.09
Zi-Ka-Wei.....	58.6	52.3	-6.3	30.12	30.10	-0.02
Tokel.....	47.6	46.8	-0.8	30.32	30.27	-0.05
Pekin.....	35.3	38.7	+3.4	30.46	30.24	-0.22
Tashkend.....	40.9	44.4	+3.5	30.29	30.19	-0.10
Nukuss.....	41.7	42.8	+1.1	30.04	30.04	Normal
Beirut.....	73.4	70.3	-3.1	30.02	30.06	+0.04
Mauritius.....	78.2	77.9	-0.3	29.81	29.78	-0.03
Fort Napier.....	77.2	77.1	-0.1	30.02	30.01	-0.01
Cape Town.....	72.9	72.6	-0.3	29.53	29.54	+0.01
Free Town.....	85.0	86.4	+1.4	29.97	29.95	-0.02
Paramaribo.....	83.1	82.8	-0.3	30.09	29.88	-0.21
Funchal.....	70.1	67.6	-2.5	30.14	29.91	-0.23
Ponta Delgado.....	65.3	65.1	-0.2	30.14	29.91	-0.23
Angra.....	62.3	62.6	+0.3	29.91	29.91	Normal
Bridgetown.....	61.6	60.2	-1.4	29.92	29.91	-0.01
Nassau.....	61.5	79.7	+1.8	29.92	29.91	-0.01
Medellin.....	66.3	65.4	-0.9	.....	.....	.....
San Jose de Costa Rica.....	64.3	66.6	+2.3	.....	.....	.....



Comparative Thermometric and Barometric Means, etc.—Continued.

STATION.	Mean temperature.			Mean barometer.		
	Nov., 1877-78.	Nov., 1878.	Departure.	Nov., 1877-78.	Nov., 1878.	Departure.
Mexico.....	49.2	46.6	- 2.6	30.25	30.29	+0.04
Melbourne.....	55.8	57.0	+ 1.2	29.96	29.82	- 0.14
Hobart Town.....	54.3	55.4	+ 1.1	29.67	29.66	- 0.01
San Juan de Puerto Rica.....	78.7	78.1	- 0.6	29.10	29.08	- 0.02
Nassau.....	74.9	75.7	+ 0.8	30.02	30.00	- 0.02
Havana.....	74.9	74.9	—	29.98	30.00	+0.02
Astrakhan.....	44.8	40.5	- 4.3	30.25	30.19	- 0.06
Athens.....	63.6	60.1	- 3.5	30.04	30.02	- 0.02
Lahore.....	69.0	65.5	- 3.5	29.97	30.00	+0.03
Tiflis.....	55.5	54.0	- 1.5	30.20	30.15	- 0.05
Laghouat.....	61.1	66.4	+ 5.3	30.07	30.15	+0.08
Fort de France.....	79.8	77.7	- 2.1	29.83	29.83	—
Lisbon.....	58.3	61.7	+ 3.4	30.07	29.98	- 0.09
Madrid.....	51.6	56.1	+ 4.5	30.02	30.04	+0.02
Cagliari.....	63.1	62.1	- 1.0	29.95	29.96	+0.01
Gibraltar.....	.....	.....	.....	30.14	29.96	- 0.08
Sandwick Manse.....	42.0	43.5	+ 1.5	29.55	30.22	+0.67
Malta.....	69.3	64.9	- 4.4	29.97	29.88	- 0.09

**Chart No. V.**—This chart displays the tracings of the probable courses of twenty of the principal storm areas of the Northern Hemisphere for the month of February, 1880. The approximate paths of progressive movement are based upon daily simultaneous international observations to the number of over 650, besides a large mass of irregular data, which reaches this office in various ways, from the logs of vessels of the *Merchant Marine* of the North Atlantic and North Pacific oceans. Concerning the general distribution of the paths of the areas of barometric minima, the following is given: one area crossed southern Greenland from the northern portion of the British Possessions. Fifteen areas traversed portions of the United States, five of which came from the Pacific ocean, five from the British Possessions and one from the Gulf of Mexico. Twelve of these areas reached the Atlantic ocean, five of which crossed the same to the mainland of northern Europe. Over the ocean, one area first appeared south of Greenland, two off the northwestern coast of Norway and one north of the Azores. Of the storms in North America, the following detailed descriptions are given: No. I.—This depression is charted as a continuation of area No. XXI, of the January, 1880, chart. Central morning of the 1st in the lower St. Lawrence Valley, it moved rapidly eastward during the day, and by the following morning was central off the banks of Newfoundland. 2d, in 44° 20' N., 43° 57' W., 29.35, W., force 5, vessel had just passed storm centre; in 46° 13' N., 39° W., WSW., strong gale, high sea; in 46° 25' N., 41° W., NW. strong gale, high sea. Throughout the Canadian Maritime Provinces the winds were northwesterly, with increased force, and an area of 30.40 rapidly approached from the Province of Quebec. During the day the course of the depression curved to the NNE., and by the morning of the 3d it had combined with area No. III, then central between Greenland and Iceland. No. II.—This depression appeared in the Western Gulf on the 1st. In central and southern Texas rain and snow, with northeast to northwest winds, prevailed during the day. To the northward a high pressure area of 30.40 and above extended over the Mississippi and Missouri Valleys to Manitoba. On the 2d the depression was central off the coast of Louisiana, and rain was quite general throughout the Gulf States; New Orleans, 29.62, a fall of 0.53 inch in past 24 hours, wind shifted from NE. 10 miles per hour to E. 29 miles, weather changed from cloudy to heavy rain; Galveston, 29.87, a fall of 0.29 inch, W., 22 miles per hour, threatening. During the day the depression passed rapidly northeastward over the northern portion of the Eastern Gulf States, and on the morning of the 3d was central in southeastern Virginia; Washington, D. C., 29.33, a fall of 1.16 inches, N., light rain; Norfolk, 29.35, a fall of 1.01 inches, SW., 28 miles per hour, fair; Lynchburg, 29.43, a fall of 1.02 inches, NW., light snow; Baltimore, 29.32, a fall of 1.19

inches, E., light rain; Cape May, 29.24, a fall of 1.24 inches, E. 24 miles per hour, foggy; Cape Hatteras, 29.42, a fall of 0.89 inch, W., 34 miles, light rain, 3.54 inches rainfall in past 24 hours; Portsmouth, N. C., 2.98 inches rainfall in past 24 hours; Cape Lookout, N. C., 2.91 inches rainfall in past 24 hours. Off the Middle Atlantic coast heavy northeast to southeast gales prevailed. In 37° N., 71° 30' W., heavy gale from ESE. to WSW. veering to W., lasting 26 hours, heavy sea and snow squalls, vessel before wind under bare poles for 10 hours, lost deck load; in 38° 40' N., 73° W., heavy gale from NE. to NW., increasing at 2 p.m. to violent hurricane; off Fire Island, terrific gale from E. veering to NW. and increasing to hurricane with high sea; off Cape Fear, heavy gale from E. veering to S. and W.; in 42° N., 62° 24' W., NW., heavy gale; in 41° N., 67° W., NE. to SE., strong gale and snow; in 38° N., 69° 30' W., heavy westerly squalls and high sea. 4th, depression central over the Gulf of St. Lawrence. Sydney, N. S., 29.15, a fall of 1.28 inches, SW., 24 miles per hour, cloudy; Charlottetown, P. E. Island, 29.06, a fall of 1.35 inches, NE., light snow; Little Glace Bay, N. S., 29.12, a fall of 1.29 inches, SE., cloudy; Windsor, N. S., 29.27, a fall of 1.14 inches, SW., snow. Snow with southwest to northwest winds was quite general throughout the Canadian and Maritime Provinces. Over the ocean between the parallels of 40° and 50° N., and west of 40° W., heavy westerly gales were experienced. In 41° N., 66° 40' W., SE. to WNW., heavy gales, high confused sea; in 43° N., 52° W., heavy southwesterly gale; in 41° N., 58° W., violent westerly gale, vessel dismantled; in 42° 15' N., 46° 55' W., succession of violent gales from SW to WNW., with high confused sea; 5th, depression central in about 40° N., 50° W.; in 50° 38' N., 42° 15' W., 29.13, W., force 7, heavy westerly squalls, high confused sea; in 51° 30' N., 42° 20' W., 29.10, SW., force 8, heavy rain squalls; in 46° 20' N., 46° 10' W., 29.65, WSW., force 4, rain; in 45° 24' N., 46° 17' W., WNW., strong gale, high sea; in 42° N., 42° W., moderate westerly gale, hard squalls; in 48° N., 33° W., WNW., W. and SW., strong gales, gloomy weather, heavy sea; in 48° N., 35° W., SW. and W., heavy gale, high confused sea; in 48° N., 30° W., NW., stormy, high sea, much water on deck; in 45° 09' N., 49° 22' W., heavy SW. gale with tremendous sea. 6th, depression central southwest of Iceland. The following observations were reported from Stykkisholm during the approach and passage of the depression: 5th, 29.13, SW., force 6, snow; 6th, 28.38, NE., force 7, snow; 7th, 28.54, NE., force 8, snow; 8th, 28.88, SE., force 2, snow; 9th, 28.88, N., force 6, fair; 10th, 29.10, E., force 6, clear. The following observations were reported from Godthaab during the approach and passage of the depression: 5th, 29.58, NE., force 4, clear; 6th, 29.50, NNE., force 4, clear; 7th, 29.37, NW., force 3, fair; 8th, 29.26, NNW., force 4, clear; 9th, 29.24, N., force 4, snow. On the 6th, the pressure throughout the British Isles fell to 29.80 and below, showing a change of from 0.10 to 0.60 inch in previous 24 hours. The winds shifted to south and southeast with increased energy and rainy or threatening weather generally prevailed. At North Unst the barometer fell to 28.85, a change of 0.55 inch in past 24 hours, wind SW., force 8; Thorshavn, 28.97, a fall of 0.59 inch, SSE., force 8, fair. 7th, North Unst, 28.88, SW., force 7; Thorshavn, 28.66, W., force 8. 8th, North Unst, 29.20, W., force 4; Thorshavn, 29.19, SSW., force 2. 9th, North Unst, 29.48, S., force 2; Thorshavn, 29.37, S., force 4. Along the Norway coast the barometer ranged on the different dates as follows: 6th, from 29.50 at Tromso to 29.81 at Bergen; 7th, from 29.04 at Brono to 29.32 at Bergen; 8th, from 29.16 at Tromso to 29.29 at Brono; 9th, from 29.30 at Tromso to 29.57 at Bergen. From the 6th to the 8th inclusive, rain or snow prevailed throughout Norway with strong southerly winds. During the 9th the depression passed northeastward over northern Scandinavia and by the following morning was central near the White sea. Archangel, 29.62, SSW., force 4, snow. Passing rapidly southeastward the depression was central morning of the 11th near 60° N., 80° E. Barnaul, 29.45, a fall of 1.05 inches, SW., cloudy; Yeniseisk,

29.58, a fall of 0.79 inch, calm, clear. During the day the depression disappeared in central Siberia under the influence of a high pressure area, 30.60. No. III.—This depression appeared on the 1st south of Greenland as a continuation of area No. XXI, chart No. V, January, 1880. In studying the development of this storm it was deemed advisable to withhold what could only be a partial description with the January chart, and embody the whole in an unbroken narrative accompanying chart No. V, for February. Accordingly the incipient stages of the depression are described as follows: developed slowly in the Plateau regions during the 25th, 26th, and 27th of January, as the result of extended atmospheric changes accompanying the formation and progress of areas Nos. XIX and XXII, January chart. Light rain and snow with variable winds attended its dilatory movement in these regions. The progress of the depression to the eastward for the first three or four days was much delayed owing to the sluggish movement from the British Possessions of a high pressure area in rear of depression No. XIX. By the morning of the 29th the high barometer (30.60) had moved to the Lake Region, while the depression assumed a more decided form and became central in the Middle Slope; lowest barometer at Denver, 29.60, a fall of 0.34 inch, S., clear. During the day the depression moved rapidly northeastward, with increasing energy towards the Upper Lake Region, and by the morning of the 30th, was central in northern Wisconsin, while the high area above referred to embraced the Middle Atlantic States, New England and the Canadian Maritime Provinces. Lowest barometer at Escanaba, 29.48, a fall of 1.20 inches, SW., light rain; Marquette, 29.51, a fall of 1.13 inches, S., cloudy; Milwaukee, 29.65, a fall of 0.88 inch, SW., light rain. 31st, depression central over the Gulf of St. Lawrence, followed throughout the Lake Region, Ohio Valley, Canada and the Middle Atlantic States by westerly winds, with occasional light rain and snow. Lowest barometer at Dalhousie, N. B., 29.22, a fall of 1.50 inches, W., fair; Bathurst, N. B., 29.20, a fall of 1.46 inches, SW., clear; Chatham, N. B., 29.30, a fall of 1.43 inches, SW., cloudy; Little Glace Bay, N. S., 29.40, a fall of 1.15 inches, S., raining. Although the fall in pressure was remarkable and sudden, yet the precipitation accompanying the depression on this day, though quite general, was very light. The highest wind velocities were reported as follows: Mt. Washington, NW., 72 miles; Boston, W. 45; Father Point, N., 42; Yarmouth, N. S., SW., 36; Cape May and Newport, SW., 32; Montreal and Sandy Hook, W., 28. February 1st, depression central south of Greenland. Godthaab, 28.97, a fall of 0.04 inch, ENE., force 4, cloudy; Stykkisholm, 29.10, a rise of 0.43 inch, SW., force 7, snowing. 2d, Godthaab, 28.94, a fall of 0.03 inch, NNE., force 4, cloudy; Stykkisholm, 28.90, a fall of 0.20 inch, SW., force 4, snowing. 3d, Godthaab, 29.22, a rise of 0.28 inch, SW., force 6, snowing; Stykkisholm, 29.22, a rise of 0.32 inch, SW., force 6, snowing. During the day the area moved northeastward beyond Iceland, being central on the 4th in about 67° N., 10° W. Stykkisholm, 29.24, SW., force 4, snowing; Thorshavn, 29.62, a fall of 0.11 inches, W., force 5, cloudy; North Unst, 29.83, a fall of 0.03 inch, SW., force 6, cloudy. 5th, depression central, with diminished energy, off the northwestern coast of Norway. Tromsø, 29.09, a fall of 0.15 inch, SW., snowing; Haparanda, 29.28, a fall of 0.36 inch, SW., clear; Bronø, 29.25, a fall of 0.38 inch, NNE., rain and snow; Bergen, 29.54, a fall of 0.55 inch, S., 35 miles per hour, raining. During the day the depression passed rapidly southeastward over northern Scandinavia and Finland, and by the morning of the 6th was central south of the White Sea, inclosed by the isobar of 29.40. To the westward the winds shifted to northwesterly, with increased force, but accompanied by only a slight rise in pressure, owing to the rapid advance and extended influence of area No. II. The following low pressures were reported from northwestern Russia: Archangel, 29.56, NNE., 18 miles per hour, snowing; St. Petersburg, 29.35, a fall of 0.37 inch, WNW., 29 miles per hour, cloudy; Dorpat, 29.64, a fall of 0.28 inch, WSW., fair; Mos-

cow, 29.68, a fall of 0.19 inch, S., cloudy. The changes in pressure over this region are not very marked, owing to the recent passage of area No. V. 7th, depression central, with greatly increased energy in western Siberia; lowest barometer at Ekaterinburg, 28.83, a fall of 0.49 inch, WSW., 31 miles per hour, drifting snow; this is one of the lowest pressures reported from Ekaterinburg for several years, and was doubtless due to the rapid succession of areas Nos. III, IV and V over that region. Kasan, 29.42, a fall of 0.08 inch, NNW., 27 miles per hour, clear; Krotkovo, 29.55, a fall of 0.11 inch, N., cloudy. 8th, depression central in the valley of the Obi; Ekaterinburg, 30.16, a rise of 1.33 inches, W., 18 miles per hour, clear; Barnaul, 29.76, a fall of 0.12 inch, SW., 22 miles per hour, cloudy; Yeniseisk, 29.56, a fall of 0.39 inch, S., 11 miles, snowing. 9th, depression central in the valley of the Yenisei; Barnaul, 29.57, a fall of 0.19 inch, W., 13 miles, cloudy; Yeniseisk, 29.73, a rise of 0.17 inch, WSW., 20 miles, snowing. During the day the depression disappeared in a high pressure area over central Siberia. 10th, Barnaul, 30.50, SW., cloudy; Yeniseisk, 30.37, calm, clear. No. VI.—This depression appeared to form over the Northern Slope during the 3rd, and by the following morning was central in Dakota, accompanied by snow and southwest to northwest winds. Displaying but very little energy it moved eastward during the day, and by the morning of the 5th was central north of Lake Superior. Moose Factory, 29.87, N., cloudy. During the day the depression disappeared over northern Canada, accompanied by snow in the Lower Lake Region and New England, winds shifting to west and northwest, with rapidly rising pressure. No. VII.—This depression first appeared in the Saskatchewan valley on the 5th, thence moved rapidly southeastward into the Upper Missouri Valley, and by the following morning was central in the Upper Mississippi Valley, accompanied by light to heavy snow; lowest barometers at North Platte and Omaha, 29.89 and 29.93, respectively. 7th, depression central in the Lower Lake Region and rapidly filling up, attended by light snow and southwest to northwest winds. During the day the depression disappeared to the eastward off the Middle Atlantic coast, followed by a decidedly rapid advance of high pressure from the west and northwest. By morning of the 8th an area of 30.60 embraced the Middle Atlantic coast. No. VIII.—Following the rapid disappearance of area No. VII, this depression appeared in the Saskatchewan valley on the 7th and moved rapidly eastward over northern Montana and Dakota to Lake Superior, where it was central on the morning of the 8th, but with little energy. On this morning the barometer at Fort Garry read 30.50, while the area of low was inclosed by the isobar of 30.00. With slowly decreasing pressure at the centre, the depression passed eastward to the Canadian Maritime Provinces, and on the morning of the 9th was inclosed by the isobar of 29.60; lowest barometer (29.42) at Chatham and Dalhousie, N. B. Passing eastward over Newfoundland during the day the depression was central over the ocean on the 10th in about 50° N., 40° W., with greatly increased energy. In 53° 58' N., 27° 49' W., 29.47, SW., force 5, high westerly sea; in 48° 57' N., 38° 04' W., 28.80, WSW., light winds, very heavy rain; in 49° N., 31° 40' W., N. to SW., heavy gale, very high sea; in 48° N., 32° 22' W., strong westerly gale, high sea and rain; in 50° 28' N., 22° W., heavy gale, high sea. 11th, in 52° 54' N., 29° 50' W., 28.41, W., force 10, very heavy westerly sea; in 49° 53' N., 29° 58' W., 29.11 NW., force 3, heavy sea; in 50° N., 23° W., NE., strong gale, heavy seas continually breaking over vessel, five seamen disabled, wind finally backed to SW. with high cross sea, decks swept; in 50° N., 21° W., WNW., hard gale, high sea. 12th, depression central off the northwestern coast of Iceland. The following observations were reported from Stykkisholm during the approach and passage of this depression. 10th, 29.10, E., force 6; 11th, 28.72, E., force 6; 12th, 28.36, SE., force 8, rain; 13th, 29.46, SW., force 7, snow. The following observations were reported from Godthaab during the approach and passage of this depression: 11th, 29.60, N., force 4; 12th, 29.46, NNW., force 5, snow.



No. IX.—This depression began to enter the Northwest during the 8th and by the following morning was central in Dakota. 9th, Bismarck, 29.88, a fall of 0.52 inch, SW., clear; York Factory, 29.88, a fall of 0.20 inch, S., threatening. Between these two stations the pressures at Pembina and Fort Garry were 30.06 and 30.16 respectively, wind S., cloudy. 10th, depression central north of Lake Superior. Moose Factory, 29.79, a fall of 0.59 inch, SW., cloudy; Marquette, 29.90, a fall of 0.58 inch, W., clear; Escanaba, 29.89, a fall of 0.62 inch, NW., cloudy; York Factory, 30.07, SW., snow; Fort Garry, 29.94, SW., clear; Duluth, 29.94, a fall of 0.53 inch, SW., clear. During the day the depression disappeared over northern Canada in a high pressure area, 30.30. No. X.—This disturbance entered the North Pacific Coast on the 10th and passed eastward over Washington Ter.; Olympia, 29.65, a fall of 0.48 inch, SW., fair; Portland, Or., 29.78, a fall of 0.42 inch, SE., cloudy. Moving rapidly eastward during the day the depression became central in western Colorado on the 11th; lowest barometer at North Platte, 29.07, a fall of 0.76 inch, NW., fair; Cheyenne, 29.44, a fall of 0.46 inch, NW., clear; Dodge City, 29.14, a fall of 0.76 inch, SW., cloudy. On this day the isobar of 29.80 embraced almost the entire portion of the United States included within the meridians of 90° and 120° W.; snow with southwest to northwest winds prevailed in the Plateau Regions and threatening or rainy weather with southerly winds in the Mississippi Valley. During the 11th the course of the depression changed from east to northeast as the area moved over the northern portions of the Upper Mississippi Valley and Upper Lake Region. 12th, depression central north of Lake Superior. Moose Factory, 29.01, a fall of 1.06 inches, NE., snow; Marquette, 29.24, a fall of 0.65 inch, W., cloudy; Alpena, 29.20, a fall of 0.94 inch, SW., cloudy; Parry Sound, Ont., 29.24, a fall of 1.01 inches, S., cloudy; Rockcliffe, Ont., 29.27, a fall of 1.06 inches, calm, light hail; Saugeen, Ont., 29.28 a fall of 0.95 inch, S., clear. The winds throughout the Upper Lake Region shifted to west with increasing force and in the Lower Lake Region, from southeast to southwest. The eastward movement of the area on the 12th cannot be clearly indicated owing to lack of reports from the country east of Hudson's Bay. On the 13th the depression was probably central near the entrance to Davis Straits. In the Lake Region the winds had shifted to northerly with falling pressure owing to the advance northeastward over the Ohio Valley of area No. XI. In the Canadian Maritime Provinces the barometer fell decidedly with southerly winds, the isobar of 29.60 replacing that of 30.20 of the previous day. The following observations were reported from Godthaab during the approach and passage of the depression. 12th, 29.46, NNW., force 5, snowing; 13th, 29.20, NNE., force 6, cloudy; 14th, 29.20, NE., force 4, cloudy; 15th, 28.99, NNE., force 2, cloudy; 16th, 29.72, NW., force 4, cloudy; 17th, 29.71, NE., force 2, cloudy; 18th, 29.83, NW., force 3, snowing. The following observations were reported from Stykkisholm during the approach and passage of the depression. 13th, 29.46, SW., force 7, snowing; 14th, 28.82, SE., force 8, cloudy; 15th, 29.56, SE., force 6, cloudy; 16th, 29.57, E., force 2, clear; 17th, 29.54, NE., force 8, cloudy; 18th, 29.51, NE., force 8, snowing; 19th, 29.34, NE., force 8, fair; 20th, 29.50, NE., force 7, fair. From the 13th to 19th the winds over the British Isles remained steady from southwest to southeast and east with maximum wind velocities ranging from 24 to 53 miles. The barometer ranged as follows: 13th, 29.88 at North Unst to 30.37 at Helston; 14th, 29.24 at Monach Light-house to 30.02 at Helston; 15th, 28.87 at Valencia to 29.96 at Silloth Rectory; 16th, 28.43 at Roche's Point and 28.45 at Galway to 29.49 at North Unst; on this day the barometers at 30 stations fell below 29.00; 17th, 28.70 at Monach Light-house and Valencia to 29.40 at Helston; 18th, 28.85 at Galway and Monach Light-house to 29.65 at Helston; 19th, 28.34 at Monach Light-house to 29.59 at Helston; on this day the barometers at 15 stations fell below 29.00. The following reports from the logs of vessels indicate the influence of this severe storm. 15th, in 54° 27' N., 19° 50' W., 28.50, SSE., force 8,

very high sea; in 49° 26' N., 11° 57' W., 28.82, SW., force 6, heavy sea; in 51° 20' N., 30° 20' W., hurricane from NW., with dangerous cross sea, decks swept. 16th, in 53° 17' N., 25° 11' W., 28.30, ENE., force 6, heavy sea; St. George's Channel, England, 28.53, SE., force 8, stormy, heavy rain; in 49° 14' N., 16° 02' W., 28.77, NW., force 5, heavy sea, hailing; in 49° 40' N., 13° 31' W., SW., SE., and NW., very stormy; in about 52° N., 30° W., terrific hurricane from southeast to southwest with dangerous cross sea; in 39° 20' N., 59° W., violent hurricane from SW. to NW.; in 46° N., 36° 29' W., violent SW., gale, heavy sea. 17th, in 42° 10' N., 56° 40' W., NNW., strong gale, violent squalls very heavy sea; in about 48° 50' N., 35° 20' W., continuation of violent hurricanes since the 15th, several men washed overboard and drowned, vessel abandoned in a sinking condition; in 51° 08' N., 32° W., 28.98, NNE., force 6, rough sea; in 44° 19' N., 51° 09' W., 29.55, NW., force 9, very heavy sea, snowing; in 49° 07' N., 19° 31' W., 28.65, WNW., force 6, heavy sea. 18th, in about 49° N., 30° W., wind veered to NNW., blowing a hard gale, with violent squalls of hail, high cross sea, vessel ran to SSW. for 30 hours when gale moderated, barometer gradually rose from 28.80 to 30.14; in 45° N., 42° 26' W., NNW., strong gale, heavy sea; in 45° N., 43° W., violent northerly gale, very high sea; in 41° 34' N., 28° W., W., strong gale, heavy sea continuing all day; in 49° 10' N., 39° 68' W., 29.05, N., force 6, high sea, light rain; in 49° 02' N., 22° 40' W., 28.68, W., force 6, heavy sea, two hours of rain; in 48° 50' N., 26° 52' W., 29.16, W., force 5, cloudy. The peculiar movement of the depression from the 14th to the 19th was probably due to the very high pressures over central and northern Europe, which did not give way until the morning of the latter date. 13th, pressures ranged from 30.20 to 30.79, highest in southeastern Russia; 14th, from 30.15 to 30.62, highest in southeastern Russia; 15th, from 30.10 to 30.72, highest in northern Russia; 16th, from 30.00 to 30.87, highest in northwestern Russia; 17th, from 30.00 to 30.91, highest in northwestern Russia; 18th, from 30.00 to 30.77, highest in northwestern Russia; 19th, 30.00 to 30.69, highest in southern Russia. On this day (19th) the isobar of 29.80 ran continuously from 20° E., to 70° W., and generally embraced the region between the parallels of 40° and 70° N., the centre of the depression being located over the Hebrides, barometer, at Monach Light-house, 28.34. Continuing the course of the area to the eastward, it was found to be central on the morning of the 20th north of Scotland; lowest barometer at North Unst, 28.75, S., cloudy; Monach Light-house, 28.96, NW., fair; Aberdeen, 28.93, SW., cloudy; Bolton, 29.10, SW., threatening; Thorshavn, 28.84, NE., cloudy; Bergen, 28.93, S., raining; Brono, 29.10, ESE., cloudy; Christiania, 29.14, NNE., snowing; Tromso, 29.31, SE., clear. Throughout Sweden the barometer ranged from 29.22 at Upsala to 29.61 at Haparanda, winds east to south. 21st, depression central in southern Sweden, with greatly diminished energy. Wisby, 29.32, W., cloudy; Stockholm, 29.35, NNE., cloudy; Upsala, 29.38, NNE., snowing; Dorpat, 29.40, a fall of 0.21 inch, ESE., snowing. 22d, depression central east of the Gulf of Finland. St. Petersburg, 29.70, a rise of 0.21 inch, NNE., fair; Dorpat, 29.77, a rise of 0.37 inch, NNW., fair; Moscow, 29.63, a fall of 0.29 inch, S., cloudy; Archangel, 29.48, a fall of 0.14 inch, SE., cloudy. During the day the depression moved eastward to central Russia, gradually filling up. 23d, Kasan, 29.85, S., snowing; Lugan, 29.78, SW., cloudy; Moscow, 29.79, N., cloudy; Archangel, 29.80, W., clear. During the day the course of the depression changed to the south, and on the following morning the area was central in about 40° N. 40° E. Lugan, 29.85, WSW., fair. Depression rapidly filling up, and by the morning of the 25th the isobar of 30.15 replaced that of 29.80 of the day before. No. XI.—As area No. X passed northeastward to the Upper Lake Region on the 11th this depression developed over western Texas, probably through the influence of the warm southerly winds from the Western Gulf, which at that time, prevailed throughout Texas and northward to Kansas. During

the 12th the depression passed rapidly northeastward over the Western Gulf States, accompanied by southerly gales along the northern Gulf coast, and heavy rains throughout Arkansas, Tennessee and the Ohio Valley. Violent local storms occurred in portions of Kentucky and Tennessee, causing considerable destruction to property. Lowest barometers were reported as follows: Coleman City, Tex., 29.42; Concho, Tex., 29.27; Dodge City, Kan., 29.48; Ft. McKavett, Tex., 29.19; Ft. Sill, Ind. T., 29.46. 13th, depression central in Kentucky; Nashville, 29.52, a fall of 0.32 inch, S., heavy rain, 2.63 inches in past 24 hours; Cairo, 29.52, a fall of 0.31 inch, N., light rain; Knoxville, 29.60, a fall of 0.39 inch, SW., cloudy; Memphis, 29.50, a fall of 0.33 inch, E., cloudy, 3.05 inches rainfall in past 24 hours. On this day the central area was inclosed by the isobar of 29.60, which embraced a narrow barometric trough extending from Arkansas northeastward to southern New York. The isobar of 29.80 embraced almost the entire country east of the 90th meridian, and from the Atlantic coast it ran thence eastward just north of parallel 40° to the British Isles, and again northeastward to parallel 70° N., inclosing within this vast region three separate areas of low pressure, viz; Nos. X, XI and XII. The heavy rains of the 12th and 13th caused dangerous freshets in the Ohio, Cumberland and Tennessee rivers, and considerable property was destroyed by floods. Moving rapidly northeastward over the Ohio Valley and Middle Atlantic States on the 13th, the depression became central on the following morning over the ocean southwest of Nova Scotia. Eastport, Me., 29.46, a fall of 0.19 inch, NE., light rain; Portland, Me., 29.42, a fall of 0.23 inch, NW., light rain; Yarmouth, N. S., 29.42, a fall of 0.31 inch, SE., foggy; Little Glace Bay, N. S., 29.62, NE., snowing; Halifax, N. S., 29.55, a fall of 0.13 inch, NE., light rain; St. John, N. B., 29.62, NE., rain and hail. During the day the depression passed northeastward over the Canadian Maritime Provinces, followed by rapidly rising pressure, with winds shifting to northerly. The effect of the depression as it passed eastward over the ocean is indicated to some extent by the following reports: 14th, in 44° N., 47° W., NW., strong gale, high sea; in 44° N., 46° W., NW. and W., strong gale, heavy westerly sea; in 47° N., 40° W., NNW., moderate gale, high confused sea. During the 15th the depression combined with area No. X then central in about 55° N., 35° W. No. XIII.—This disturbance entered the north Pacific coast on the 14th accompanied by light to heavy rains in Oregon and Washington Territory. Olympia, 29.81, a fall of 0.47 inch, SW., light rain, 2.46 inches in past 24 hours; Portland, Or., 30.02, a fall of 0.39 inch, SW., heavy rain; Umatilla, 29.99, a fall of 0.49 inch, W., cloudy. During the day the depression passed rapidly eastward along the northern boundary of the United States, accompanied by northerly winds and snow in the Saskatchewan valley and southerly winds with cloudy and threatening weather in the northern Rocky Mountain Region. 15th, depression central in northern Minnesota; Breckenridge, 29.52, a fall of 0.47 inch, W., fair; Duluth, 29.77, a fall of 0.09 inch, NW., cloudy; St. Paul, 29.63, a fall of 0.21 inch, SE., fair; Pembina, 29.51, a fall of 0.36 inch, E., cloudy. During the day the depression rapidly filled up over the Upper Lake Region and by the morning of the 16th had disappeared over northern Canada. No XIV.—This depression entered the North Pacific Coast on the 15th, following closely the disappearance to the eastward of area No. XIII. Olympia, 29.62, a fall of 0.19 inch, NW., light snow; Portland, Or., 29.66, a fall of 0.36 inch, calm, fair; Roseburg, Or., 29.81, a fall of 0.51 inch, SW., light rain; Umatilla, 29.69, a fall of 0.30 inch, SE., light rain. During the day the depression passed rapidly eastward over the Plateau Regions and by morning of the 16th was central in the Middle Slope. Cheyenne, 29.72, a fall of 0.10 inch, SW., clear; North Platte, 29.19, a fall of 0.47 inch, S., fair; Denver, 29.55, a fall of 0.33 inch, NW., clear; Dodge City, 29.39, a fall of 0.46 inch, S., fair. Very little precipitation attended the area on this day, either preceding or following its northeasterly movement. For the 24 hours ending morning of the 17th, only fifteen stations throughout the

United States reported even the slightest precipitation, the amounts ranging from trace to 0.34 inch. 17th, depression central with greatly diminished energy in northern Wisconsin, inclosed by the isobar of 29.80, which extended southwestward from Lake Superior to the Rio Grande Valley. Along the western limit of this area the winds were west and northwest with clear or partly cloudy weather, and along the eastern limit, southerly with generally cloudy weather. 18th, depression central over the Province of Ontario, inclosed by the isobar of 29.80. Parry Sound, 29.66, a fall of 0.44 inch, W., light rain; Stratford, 29.77, a fall of 0.37 inch, SW., heavy rain; Granton, 29.76, a fall of 0.37 inch, calm, raining. Port Stanley, 29.82, a fall of 0.37 inch, W., light rain. 19th, depression central over the Gulf of St. Lawrence, followed over the Lower Lakes and in the Middle Atlantic States by rapidly rising pressure and northwesterly winds with light to heavy snow in the former. Dalhousie, N. B., 29.40, a fall of 0.77 inch, W., clear; Charlottetown, P. E. Island, 29.44, a fall of 0.81 inch, SW., cloudy; Bathurst, N. B., 29.39, a fall of 0.72 inch, NW., fair. 20th, depression central off the Banks of Newfoundland. St. Johns, N. F., 29.57, a fall of 0.52 inch, W., fair; in 44° 11' N., 62° 24' W., 29.79, WNW., force 6, cloudy; in 45° 30' N., 52° 30' W., 29.70, W., force 6, snowing. 21st, depression central in about 55° N., 35° W., inclosed by the isobar of 29.80. It is rather difficult to locate the position of the central area on this date, owing to the lack of sufficient reports and the peculiar disposition of the surrounding depressions; area No. X over southern Scandinavia and the North Sea and area No. XVII central over Baffin's Bay. During the 21st area No. XIV probably combined with No. XVII, the latter then central west of Iceland. No. XV.—This disturbance entered the North Pacific Coast Region on the 18th, the isobar of 29.60 replacing that of 30.20 of the previous day. Light rain, with southerly winds accompanied the depression, extending as far south as central California. As the depression passed to the eastward during the day, light snow with westerly winds, followed its departure in the Middle and Northern Plateau regions. 19th, depression central in Montana; Virginia City, 29.51, a fall of 0.14 inch, calm, cloudy. 20th, central in northern Dakota; Ft. Buford, 29.79, a fall of 0.40 inch, NW., clear; Pembina, 29.70, a fall of 1.07 inches, S., cloudy; Breckenridge, 29.86, a fall of 1.00 inch, S., clear; Ft. Garry, 29.71, a fall of 1.16 inches, SW., clear. The central area was inclosed by the isobar of 29.80, which extended southwestward from Manitoba to New Mexico. The progress of the area on the 19th and 20th was necessarily very slow, owing to the extremely high pressures which prevailed in the Northwest and Upper Mississippi Valley, ranging from 30.60 to 30.86. 21st, depression central over the Province of Ontario, the isobar of 29.60 replacing that of 30.60 of the previous day; Parry Sound, 29.49, a fall of 1.18 inches, SW., light snow; Saugeen, 29.54, a fall of 1.08 inches, W., snowing; Rockliffe, 29.53, a fall of 1.07 inches, NW., cloudy; Montreal, 29.67, a fall of 0.85 inch, S., cloudy; Buffalo, 29.58, a fall of 1.08 inches, SW., heavy snow. Light to heavy snow was reported from 12 Canadian and 8 Signal Service stations within the central depression. Since the 19th the storm has rapidly increased in energy, and now extends its influence to the Atlantic coast, having entirely displaced the high area which first obstructed its translation to the eastward. During the 21st the depression changed its course more to the north, and moved northeastward over the Province of Quebec and the Labrador Peninsula. Leaving the Labrador coast on the 22d, the depression crossed Davis' Straits and was probably central off the western coast of southern Greenland by morning of the 23d; Godthaab, 28.86, a fall of 0.51 inch, S., cloudy. During the day the depression passed rapidly over southern Greenland, and by the following morning was central north of Iceland; Godthaab, 29.77, a rise of 0.91 inch, NW., snowing; Stykkisholm, 29.59, a fall of 0.30 inch, SW., snowing. 25th, depression central in about 67° N., 00° W., Godthaab, 29.89, S., force 6, snowing; Stykkisholm, 29.33, a fall of 0.26 inch, W., cloudy; Thorshavn, 29.32, a fall of 0.50 inch, W.,



cloudy; North Unst, 29.54, a fall of 0.47 inch, WNW., cloudy; Bergen, 29.67, a fall of 0.46 inch, SW., 26 miles per hour, raining; Brono, 29.24, a fall of 0.56 inch, SE., 18 miles, raining; Tromso, 28.99, a fall of 0.60 inch, SSE., cloudy. On this day the isobar of 29.80 embraced the entire region north of 60° N., between the meridians of 60° E. and 40° W. The area of precipitation embraced the British Isles, Scandinavia and portions of northwestern Russia, with southwesterly winds increasing to gales along the various coasts. 26th, depression central in northern Sweden, inclosed by the isobar of 28.60. On this day the isobar of 29.20 embraced the whole of Scandinavia and northwestern Russia. Hernosand, 28.59, a fall of 0.88 inch, S., cloudy; Umea, 28.64, a fall of 0.69 inch, SW., cloudy; Christiania, 28.65, a fall of 1.03 inches, SW., cloudy; Tromso, 28.74, a fall of 0.25 inch, NNW., cloudy; Haparanda, 28.71, a fall of 0.42 inch, S., snowing. 27th, depression central over Finland and slowly filling up; central area inclosed within the isobar of 28.80. Archangel, 28.96, a fall of 0.04 inch, SE., cloudy; Dorpat, 28.58, a fall of 0.72 inch, SSW., snowing; St. Petersburg, 28.73, a fall of 0.49 inch, SSE., light snow; Haparanda, 28.63, a fall of 0.08 inch, N., cloudy. Along the western coast of the Baltic and the Gulf of Bothnia, the winds shifted to northwesterly, with increased force and slowly rising pressure; throughout Russia the winds were from southeast to southwest. 28th, depression central in northeastern Russia, and rapidly filling up. Kasan, 29.53, a fall of 0.34 inch, S., snowing; Ekaterinburg, 29.64, a fall of 0.50 inch, SW., snowing. During the day the depression disappeared in a high pressure area over western Siberia. No. XVI.—Closely following area No. XV this depression entered the Northwest from the Saskatchewan valley on the 21st; Fort Buford, 29.63, a fall of 0.16 inch, SW., clear; Bismarck, 29.79, a fall of 0.09 inch, SW., clear. 22d, depression central in northern Michigan, but with slight energy; lowest barometer at Escanaba, 29.70, a fall of 0.10 inch, wind NW., clear. No precipitation has attended the area since its incipency. 23d, depression central in the western portion of the Middle Atlantic States, followed in the Lower Lakes and Canada by northwesterly winds, with snow. Albany, 29.56, a fall of 0.40 inch, S., light snow; Burlington, 29.48, a fall of 0.42 inch, SW., cloudy; New York, 29.60, a fall of 0.40 inch, W., light rain. During the day the depression passed southeastward off the New England coast, followed over the Middle Atlantic States and in southern New England by northwesterly winds, clear weather and rapidly rising pressure. In northern New England and the Canadian Maritime Provinces, northeasterly winds with snow prevailed. 24th, depression central south of Nova Scotia; Halifax, 29.77, a fall of 0.08 inch, wind shifted from SSE. to NE., cloudy; in 40° 34' N., 69° W., NW., hard gale, very high sea. During the day the depression moved slowly to the northeast, its more rapid progress being hindered by a large area of high pressure northwest of the Azores, within which the barometer ranged from 30.20 to 30.73. 25th, in 43° 10' N., 56° 30' W., 29.83, E., force 6, foggy; in 41° 30' N., 66° 20' W., 29.99, N., force 6, fair. During the 25th the high pressure area, northwest of the Azores remained about stationary, forcing the depression to change its course to almost due north, passing thence over Newfoundland and becoming central on the 26th south of Greenland; Godthaab, 29.87, a fall of 0.02 inch, wind shifted from S., force 6, snowing, to N., force 2, cloudy. 27th, depression central with increased energy south of Iceland; Godthaab, 29.86, NE., force 2, fair; Stykkisholm, 28.88, a fall of 1.07 inches, NW., force 6, cloudy; Thorshavn, 28.98, a fall of 0.56 inch, SW., force 7, cloudy; North Unst, 29.36, a fall of 0.05 inch, W., force 6, cloudy; the low reading of the barometer at this station was probably as much due to the influence of area No. XV as to the present disturbance. 28th, depression central off the western coast of Norway; lowest barometer at Brono, 29.37, a fall of 0.64 inch, ENE., 36 miles per hour, cloudy. Throughout Scandinavia the pressure at all stations

was below 29.00, and snow with southwest to northwest winds prevailed. In rear of the depression the winds along the coast and over the ocean shifted to northwesterly with great force, reaching a velocity of over 70 miles per hour at Thorshavn. In Denmark, northern Germany, and along the southern shores of the Baltic southwest winds prevailed with velocities ranging from 25 to 75 miles per hour accompanied by rain and snow. The pressure over this region had hardly recovered from the passage of area No. XV and therefore the changes were rather inconsiderable except at a few stations. 29th, depression central in Finland where but two days previous area No. XV occupied a similar position. The isobar of 29.60 embraced the whole of Europe north of 50° N., and extended westward to 40° W. The central area was inclosed by the isobar of 28.60 which embraced all territory north of 60° N., and between the meridians of 10° and 40° E. Umea, 28.51, a fall of 0.20 inch, NNW., force 6, cloudy; Haparanda, 28.53, a fall of 0.11 inch, N., cloudy; Brono, 28.53, a rise of 0.16 inch, E., fair; Hernosand, 28.56, a fall of 0.04 inch, NW., fair; Tromso, 28.52, a fall of 0.19 inch, SW., clear; Archangel, 28.69, a fall of 0.15 inch, ESE., cloudy; St. Petersburg, 28.61, a fall of 0.45 inch, W., cloudy; Dorpat, 28.85, a fall of 0.27 inch, WSW., light snow; Moscow, 29.10, a fall of 0.25 inch, S, cloudy; Wilna, 29.23, a fall of 0.20 inch, SSW., threatening. Along the southern and western shores of the Baltic, in northern Germany, northern France, and in the British Isles, southwesterly winds with velocities ranging from 20 to 70 miles per hour prevailed, accompanied by rainy or threatening weather with occasionally heavy snow in northern Germany. A continuation of the course of this area will appear on chart No. V, for March, 1880. No. XVIII.—This depression appeared suddenly over Davis' Straits, north of parallel 60° N. on the 21st, and probably crossed over from the region north of Hudson's Bay. Godthaab, 28.81, a fall of 0.18 inch, S., force 4, cloudy. 22d, depression central northwest of Iceland. Godthaab, 29.37, a rise of 0.56 inch, S., force 6, snowing; Stykkisholm, 29.61, a fall of 0.23 inch, S., force 2, raining. 23d, depression central northeast of Iceland. Stykkisholm, 29.89, a rise of 0.28 inch, SW., cloudy; Thorshavn, 29.90, a fall of 0.25 inch, calm, cloudy; Tromso, 29.38, a fall of 0.34 inch, SW., 36 miles per hour, cloudy; Brono, 29.89, a fall of 0.07 inch, SW., 18 miles, cloudy; Haparanda, 29.89, a rise of 0.15 inch, SW., clear. 24th, depression central east of the White sea and rapidly filling up; lowest barometer at Archangel, 29.59, a fall of 0.21 inch, WSW., 18 miles per hour, fair. During the day the depression disappeared over northwestern Siberia. No. XVIII.—Like most of its predecessors this depression moved rapidly southeastward from the Saskatchewan valley, following closely the disappearance of the previous low area. 23d, central north of Montana, inclosed by the isobar of 29.80. During the day the depression moved eastward into Manitoba, and by the morning of the 24th, was central in northern Minnesota, inclosed by the isobar of 29.40; Fort Garry, 29.48, a fall of 0.40 inch, N., cloudy; Pembina, 29.24, a fall of 0.46 inch, calm, fair; Breckenridge, 29.30, a fall of 0.58 inch, SE., cloudy; St. Paul, 29.43, a fall of 0.58 inch, SE., cloudy; Duluth, 29.48, a fall of 0.55 inch, calm, fair. 25th, depression central in the southern portion of the Upper Lake Region; lowest barometer at Escanaba, 29.30, a fall of 0.36 inch, NW., foggy; Milwaukee, 29.33, a fall of 0.43 inch, SW., cloudy; Grand Haven, 29.38, a fall of 0.49 inch, SE., light rain. Southerly winds with rain prevailed throughout the Ohio Valley, Lower Lakes and in the Province of Ontario. During the day the depression passed eastward with diminishing pressure down the valley of the St. Lawrence, and on the following day combined with area No. XVI off the coast of Labrador. No. XIX.—While the previous area was central near the Upper Lake Region, on the 24th, this depression descended from the Saskatchewan valley, and on the following morning was central in the Northern Rocky Mountain Slope; lowest barometer at North Platte, 29.34, a rise of 0.07 inch, NW., clear; Denver, 29.66, no change, W., clear; Cheyenne, 29.55, a fall of 0.10 inch, W., clear. The pressure in this

region had not recovered from the influence of the recent passage of area No. XVIII, consequently the small changes noted. During the day the depression moved very slowly eastward, with slightly increasing energy, and by the following morning was central in the Upper Mississippi Valley. Owing to the rapid advance of a high pressure area from the region north of Lake Superior, the depression on the two succeeding days was prevented from moving in the usual course to the eastward, and consequently a curved condition of the track is indicated upon the chart. In more concise terms, the depression remained about stationary during most of the 26th and 27th. On the 28th depression central south of Lake Michigan, inclosed by the isobar of 29.80. Chicago, 29.70, a fall of 0.30 inch, N., cloudy; Milwaukee, 29.91, a fall of 0.06 inch, NE., light rain; northeast to northwest winds with rain and snow prevailed throughout the Upper Lake Region and Upper Mississippi Valley, and southerly winds with cloudy weather in the Ohio Valley and Lower Lake Region. 29th, depression central in the Province of Quebec. Cornwall, 29.32, a fall of 0.64 inch, W., clear; Montreal, 29.33, a fall of 0.55 inch, SE., cloudy; Rockliffe, 29.26, a fall of 0.75 inch, E., threatening; Quebec, 29.40, a fall of 0.81 inch, E., sleeting. The area of precipitation extended eastward to Nova Scotia with southeasterly winds. During the day the depression passed eastward over the Canadian Maritime Provinces and on the following morning was probably central off the Nova Scotia coast. The continuation of this area will appear upon chart No. V for March, 1880. No. XX.—This depression appeared on the 28th over the ocean, west of British Columbia, and by the morning of the 29th, had entered that territory, the isobar of 29.80 replacing that of 30.40 of the previous day. Rain and snow with southerly winds prevailed in Oregon and Washington Territory, and with easterly winds in the Northern Plateau Region; Olympia, 29.74, a fall of 0.50 inch, S., light snow; Portland, Or., 29.98, a fall of 0.40 inch, SE., cloudy. The continuation of this area will appear upon chart No. V for March, 1880. Of those areas charted as coming directly from the ocean, the following descriptions are given: No. IV.—This depression appeared on the 1st over northern Scandinavia as a continuation of area No. XXII, of chart No. V for January, 1880. 1st, Tromsø, 28.84, a fall of 0.17 inch, SW., 29 miles per hour, rain and snow; Haparanda, 29.30, a fall of 0.25 inch, SW., force 6, cloudy; Archangel, 29.17, a fall of 0.31 inch, WSW., 22 miles per hour, cloudy. During the day the depression passed rapidly southeastward over the White Sea, and on the 2d was central in western Siberia; Ekaterinburg, 29.16, a fall of 0.38 inch, WSW., 27 miles per hour, cloudy; Kasan, 29.58, a fall of 0.22 inch, WSW., cloudy. 3d, depression central in the valley of the Obi; Ekaterinburg, 29.52, a fall of 0.36 inch, NW., cloudy; Barnaul, 29.58, a fall of 0.25 inch, SW., 45 miles per hour, cloudy; Yeniseisk, 29.26, a fall of 0.67 inch, E., 13 miles, snowing. During the 4th the depression disappeared in a high pressure area, 30.40 over central Siberia. No. V.—While area No. III was central west of Iceland on the 3d, this depression suddenly appeared off the northwestern coast of Norway; Tromsø, 28.68, a fall of 0.70 inch, SW., raining; Bronø, 29.26, a fall of 0.41 inch, SW., 45 miles per hour, raining; Haparanda, 29.27, a fall of 0.34 inch, SW., force 4, raining. 4th, depression central southeast of the White Sea; Archangel, 29.21, a fall of 0.28 inch, WNW., 18 miles per hour, cloudy; Kasan, 29.14, a fall of 0.59 inch, W., 13 miles, light snow; Ekaterinburg, 29.30, a fall of 0.22 inch, S., cloudy. 5th, depression central east of the Ural Mountains; Ekaterinburg, 29.28, NW., cloudy; Barnaul, 29.93, a rise of 0.02 inch, SW., fair; Yeniseisk, 29.99, a rise of 0.24 inch, wind shifted from SW. to E., clear. 6th, depression probably central between the Obi and Yenisei rivers. As area No. III appeared central in northern Russia on this date and in about the same latitude, an elongated area of barometric minima (29.40) formed in connection with the two depressions and ran eastward, north of 50° N., between the meridians of 30° and 90° E., with the lowest pressure at Ekaterinburg, 29.32, a rise of 0.04 inch, WSW., 13

miles per hour, cloudy; Barnaul, 29.48, a fall of 0.45 inch, SW., 45 miles per hour, cloudy; Yeniseisk, 29.57, a fall of 0.42 inch, S., cloudy. By morning of the 7th the depression had passed east of the Yenisei and during the day disappeared over central Siberia under the influence of a high pressure area, 30.60. No. XII.—After the passage of area No. VIII northeastward north of parallel 50° N. on the 10th, the influence of its energy still remained, and was effective in developing in the vicinity of 40° N., 35° W., another storm of great severity. The following reports from logs of vessels indicate the violent effects of an attempted restoration of atmospheric equilibrium in rear of advancing area No. VIII and which were instrumental in forming area No. XII: 10th, in 42° N., 55° W., WSW. NW. and NNW., violent gales with squalls of rain, very heavy sea; in 42° N., 57° W., W. to NW., hard gale with high confused sea; in 42° 31' N., 54° 31' W., NW., heavy storm with squalls of rain; in 48° 15' N., 49° 10' W., NNW. gale with thick snow, encountered large fields of drifting ice and icebergs between 46° 54' N. and 48° 15' W.; in 41° 30' N., 41° 30' W., heavy westerly gales, high sea. 11th, in 45° N., 46° W., NW. to NNW., violent to moderate gales, rain and snow squalls, high confused sea; in about 45° N., 35° W., terrific westerly gale with high cross sea which at times burst into the saloon, one man washed overboard, steamer made only 80 miles in over 24 hours; in 48° 24' N., 33° 13' W., NW., terrific gale, very high sea; in 47° 13' N., 34° W., SW. and WNW. hurricane, changing to gale from SW. to NW. with tremendous high sea. On the 12th the depression was probably central north of the Azores, the winds at Angra and Ponta Delgado shifted from W. to S., with falling barometer. In 47° N., 38° W., SE. to NW., fresh gale, high head sea; in 46° 33' N., 39° W., SW. to NW., violent gale, with "frightful" sea; in 49° 34' N., 28° 44' W., NW., strong gale, hard squalls, high sea; in 49° 19' N., 21° 50' W., W. to N., hard gale, very high sea; in 44° N., 23° W., hurricane from SSE., vessel thrown on beams end; in 42° 35' N., 35° 55' W., "terrible" gale from SW. to W., lasting 18 hours; in 43° 02' N., 34° 22' W., strong gale veering from SW. to NW., with high seas, 7 p. m. terrific gale from W., very high sea, smashing boats and clearing decks, four seamen lost and vessel thrown on beams end. 13th, depression central in about 50° N., 20° W. In 50° 15' N., 17° 38' W., 28.86, SSW., moderate gale, heavy rain; in 51° 26' N., 34° 50' W., 29.43, NNW., force 9, heavy northerly sea; in 46° 10' N., 43° W., ESE. to NW., heavy gale, high head sea; in 44° 39' N., 43° 48' W., E. to N. with hurricane force, ship on beams end, squalls of rain and snow with a "frightful" sea; in 48° 40' N., 34° 38' W., SE. and variable, strong gale, high confused sea; in 50° 06' N., 13° W., southwest hurricane with tremendous sea, 3 a. m., heavy sea swept decks, noon, wind shifted to WNW., and blew with great violence until midnight when it changed to WSW. with heavy squalls of rain; in 49° N., 25° W., barometer 28.10, violent gale from SW., wind suddenly changed to WNW. in a most violent squall and blew a perfect hurricane, 3 p. m., tremendous westerly sea, 5 p. m., heavy cross sea sweeping decks; in 45° N., 23° W., terrific gale from SW.; in 43° N., 28° W., hurricane from NW., lasting 48 hours; in 42° N., 30° W., "hurricane" from SE. all around the compass by W., lasting 24 hours." 14th, depression moved slowly northward and during the day combined with area No. X, then central south of Iceland. In 47° 57' N., 28° W., NW., violent gale, terrific squalls, heavy sea; in 51° N., 13° 33' W., S., and W., strong gale, high sea; in 50° N., 22° 40' W., SE., SW., and NW., strong gale, very high confused sea. The continuation of this severe storm is fully considered under the head of area No. X with which, after the 14th, it became identified and together proved the most violent and extensive atmospheric disturbance of the month.

#### TEMPERATURE OF THE AIR.

The distribution of mean atmospheric temperature over the United States and Canada for the month of January, 1882, is exhibited by lines of equal thermometric mean values upon



chart No. II. The table of mean and comparative temperatures in the right-hand corner of the chart shows, in the first column, the averages for the month throughout the various districts, as deduced principally from observations taken at Signal Service stations. In the two remaining columns are shown the means for the present month, and the departures of such means from the average for many years. The temperature is everywhere above the normal, except in New England and west of the 110th meridian. The single large area of excess covers the central portion of the country, where the departures range from 1° 2 in the Middle Atlantic States to 5° 6 in the Missouri Valley. The largest area of deficiency embraces the extreme western portion of the United States, where the departures range from 1° 0 in the Southern Plateau to 4° 6 in the Middle Plateau. As a means of interesting comparison, the following maximum departures from the normal are given for each year since 1873, together with the corresponding districts: 1874, +6° 9 Ohio Valley and Tennessee, +6° 6 Middle Atlantic States and +6° 2 Lower Lake Region; 1875, -13° 1 Minnesota and -11° 6 Upper Mississippi Valley; 1876, +9° 0 Ohio Valley and Tennessee and +7° 7 Upper Mississippi Valley; 1877, -5° 4 Middle Atlantic States and -5° 8 Lower Lake Region; 1878, +13° 3 Minnesota and +12° 3 Upper Mississippi Valley; 1879, -2° 8 Middle Atlantic States and -2° 6 Lower Lake Region; 1880, +15° 5 Upper Mississippi Valley, +14° 8 Ohio Valley and Tennessee, and +13° 3 South Atlantic and West Gulf States; 1881, -9° 8 Missouri Valley and -8° 9 Southeast Rocky Mountain Slope.

**Deviations from Mean Temperatures.**—Under this heading departures exhibited by reports from the regular Signal Service stations are shown in the table of comparative temperatures on the right-hand side of chart No. II. The following items of importance, in connection with this subject, are reported by Voluntary Observers: *Connecticut*: Southington, mean temperature, 24° 3, or 1° above the mean for the past 11 years. *Illinois*: Riley, mean temperature, 20° 6, or 2° 1 above the mean for past 19 years. *Indiana*: Vevay, mean temperature considerably above the average for the month. *Kansas*: Yates Centre, mean temperature 30° 5, or 4° 4 above the average for the past 2 years. Lawrence, mean temperature 32° 68, or 5° 56 above the average for the past 14 years. Manhattan, mean temperature 31° 67, or 6° 82 above the average for past 22 years; five Januaries during this period have been warmer, viz: 1859, 1863, 1876, 1878 and 1880; the coldest January during the past 22 years occurred in 1875, mean temperature 15° 07. *Iowa*: Clinton, mean temperature considerably above the average. *Maine*: Gardiner, mean temperature 15° 75, or 2° 12 below the average for the past 46 years. *Maryland*: Fallston, mean temperature 30° 30, or 0° 31 below the average for the past 11 years; during that period, the highest January mean, 40° 13, occurred in 1880, and the lowest, 25° 05, occurred in 1881. *Michigan*: Thornville, mean temperature, 26° 0, or 4° 0 above the average for several years. *Missouri*: St. Louis, Missouri Weather Service reports, mean temperature slightly above the average for the past 45 years. *New Hampshire*: Contoocookville, mean temperature 20° 5, or about 1° 0 below the average for the past 12 years. *New York*: Palermo, mean temperature 20° 3 or 0° 8 below the average for the past 29 years; warmest January during that period, occurred in 1880, mean temperature 29° 4 and the coldest, 12° 8, occurred in 1881; the lowest temperature recorded during that period was -31° in January, 1857. North Volney, mean temperature 22° 29, or 0° 48 below the average for the past 14 years; warmest January during that period occurred in 1880, mean temperature 31° 82, coldest January occurred in 1881, mean temperature 15° 13; the lowest temperature recorded during the past 14 years was -19°, January 23d, 1871. *Ohio*: North Lewisburg, mean temperature 29° 40, or 1° 03 above the mean for the past 51 years. *Vermont*: Woodstock, mean temperature 16° 4 or about 1° above the average for the past 15 years; highest January mean during that period, 23° 8, occurred in 1880, lowest, 5° 8, occurred in 1875. *West Virginia*: Helvetia, mean

temperature 35° 6, or 2° 29 above the average for the past 6 years; Wytheville, mean temperature 36° 4, or 0° 8 above the average for the past 17 years.

Table of Maximum and Minimum Temperatures for January, 1882.

State or Territory.	Signal Service.			U. S. Army Post Surgeons or Voluntary Observers.		
	Station.	Max.	Min.	Station.	Max.	Min.
Alabama.....	Montgomery.....	0	24		0	0
Arizona.....	Tucson.....	80	—			
Do.....	Prescott.....	—	8			
Arkansas.....	Little Rock.....	70	24	Mount Ida.....	65	15
California.....	Campo.....	78	7	Fort Yuma.....	80	—
Do.....				Summit.....		1
Colorado.....	Denver.....	67	1			
Do.....	Pike's Peak.....	28	—23			
Connecticut.....	New Haven.....	51	—12	Southington.....	53	—14
Dakota.....	Rapid City.....	56	—	Fort Randall.....	57	—
Do.....	Ft. Stevenson.....	—	—32	Fort Pembina.....		—40
Delaware.....	Breakwater.....	56	10			
District of Columbia.....	Washington.....	59	8			
Florida.....	Key West.....	82	—	Ft. Brook Tampa.....	84	—
Do.....	Jacksonville and Pensacola.....		31	Fort Barrancas.....		22
Georgia.....	Savannah.....	77	—	Thornville.....	77	24
Do.....	Augusta.....		22			
Idaho.....	Lewiston.....	51	—			
Do.....	Eagle Rock.....		—30	Swanwick and Upper Alton.....	67	—
Illinois.....	Chairo.....	64	—	Elmira and Morrison.....		—7
Do.....	Chicago.....		1	Vevay.....	65	—
Indiana.....	Indianapolis.....	61	7	Lafayette.....		1
Do.....						
Indian Territory.....	Fort Supply.....	74	—			
Do.....	Keokuk.....	60	—6	Cresco.....		—17
Iowa.....	Dubuque.....	67	0			
Kansas.....	Dodge City.....	67	0	Ft. Scott.....	70	—
Do.....				Ft. Wallace.....	65	15
Kentucky.....	Louisville.....	65	16	Bowling Green.....		—
Louisiana.....	New Orleans.....	77	—			
Do.....	Shreveport.....		30			
Maine.....	Eastport.....	43	—14	Gardiner.....		—27
Do.....	Portland.....		—			
Maryland.....	Baltimore.....	69	7	Federalburg.....	61	—
Massachusetts.....	Boston.....	53	—13	Deer Park.....		—8
Do.....				Heath.....	60	—
Michigan.....	Detroit.....	56	—	South Lee.....		—24
Do.....	Alpena.....		—27	Fort Brady.....		—34
Minnesota.....	Duluth.....	47	—			
Do.....	St. Vincent.....		—42			
Mississippi.....	Vicksburg.....	74	30	Fayette.....	75	28
Missouri.....	Saint Louis and Springfield.....	60	0	Protem.....	72	—
Do.....	Fort Custer.....	52	—	Oregon.....		—4
Montana.....	Terry's Landing.....		—36	Ft. Keogh.....	50	—37
Do.....	North Platte.....	65	—8			
Nevada.....	Pioche.....	38	—	Golconda.....	74	—
Do.....	Winnemucca.....		—4	Halleck.....		—34
New Hampshire.....	Mt. Washington.....	34	—39	Contoocookville.....	46	—
Do.....				Grafton.....		—23
New Jersey.....	Atlantic City.....	59	—	Vineyard.....	62	—
Do.....	Barnegat.....		1	South Orange.....		—4
New Mexico.....	La Mesilla.....	72	—	Ft. Union.....		—11
Do.....	Santa Fe.....		7			
New York.....	Rochester.....	63	—	Ft. Niagara.....	56	—
Do.....	Albany.....		—14	Cooperstown and Johnstown.....		—27
Do.....				Weldon.....		6
North Carolina.....	Wilmington.....	73	—	Portsmouth.....	67	—
Do.....	Charlotte.....		16	Hudson.....		0
Ohio.....	Cincinnati.....	63	—			
Do.....	Cleveland.....		2			
Oregon.....	Portland.....	55	—			
Do.....	Umatilla.....		4			
Pennsylvania.....	Pittsburg.....	61	—	Milton.....	57	—
Do.....	Erie.....		—2	Blooming Grove.....		—19
Rhode Island.....	Newport.....	60	—8			
South Carolina.....	Charleston.....	76	26	Aiken.....		21
Tennessee.....	Memphis.....	71	—	Ashwood.....		16
Do.....	Knoxville.....		18			
Texas.....	Edinburg.....	84	—	Ft. Ringgold.....	86	—
Do.....	Fort Elliott.....		4			
Utah.....	Salt Lake City.....	47	0	Coalville.....		—25
Vermont.....	Burlington.....	49	—25	Woodstock.....	50	—
Do.....				Lunenburg.....		—29
Virginia.....	Norfolk.....	66	—			
Do.....	Chincoteague.....		8			
Washington Ter.....	Alfata.....	55	—			
Do.....						
West Virginia.....	Morgantown.....	64	—9	Flemington.....		8
Wisconsin.....	Milwaukee.....	62	—	Embarrass and Neillsville.....		—20
Do.....	La Crosse.....		—11	Fort Bridger.....		—23
Wyoming.....	Cheyenne.....	60	—12			

**Ranges of Temperature at Signal Service Stations.**—Monthly ranges in general varied from 40° to 60° over the country east of the Rocky Mountains, and from 45° to 70° westward to the Pacific. The *smallest* ranges are: San Francisco, 21°; Key West, 25°; Portland, Or., 29°; San Diego, 30°; Port Eads, 31°; Red Bluff and New Orleans, 33°; Olympia, 35°; Hatteras, 36°;

Galveston and Punta Rassa, 38°. The largest are: New Chicago, Mont., 90°; Terry's Landing, Mont., 88°; Fort Benton, 87°; Smithville, Dak., Fort Shaw, Mont., and Prescott, Ariz., 79°; Fort Custer, 77°; Camp Supply, Ind. Ty., 76°; Burlington, Vt., Fort Assinnaboine, Mont., and St. Vincent, 74°; Mt. Washington and Fort Missoula, 73°; Rapid City, Dak., Fort Buford and Cheyenne, 72°; Duluth, 71°; Fort Elliot, Tex., 70°. The daily ranges varied in the different districts as follows: New England, 26° at New Shoreham to 37° at Eastport and 47° on the summit of Mt. Washington; Middle Atlantic States, 21° at Lynchburg to 34° at Albany and Barnegat and 37° at Chincoteague; South Atlantic States, 23° at Charleston to 29° at Atlanta and 32° at Portsmouth; Florida Peninsula, 13° at Key West to 19° at Cedar Keys and 21° at Punta Rassa; Eastern Gulf States, 23° at Mobile, 24° at New Orleans and 28° at Montgomery; Western Gulf States, 28° at Port Eads to 30° at Indianola and 41° at Denison and Fort Gibson; Rio Grande Valley, 26° at Brownsville to 32° at Eagle Pass and 35° at Castroville; Ohio Valley and Tennessee, 21° at Columbus to 29° at

Pittsburg and 34° at Indianapolis; Lower Lake Region, 24° at Detroit and Toledo to 29° at Buffalo and 34° at Oswego; Upper Lake Region, 23° at Grand Haven to 37° at Duluth and 41° at Alpena; Extreme Northwest, 41° at St. Vincent to 44° at Fort Buford and 53° at Bismarck; Upper Mississippi Valley, 30° at Keokuk to 39° at St. Paul and 42° at St. Louis; Missouri Valley, 27° at Leavenworth to 44° at Yankton and 50° at Huron; Northern Slope, 36° at Cheyenne to 40° at Deadwood and 50° at Fort Custer; Middle Slope, 41° at Dodge City to 44° at Denver and 48° at Fort Elliott; Southern Slope, 34° at Fort Davis to 40° at Henrietta and 45° at Concho; Northern Plateau, 23° at Umatilla to 32° at Missoula and 35° at Eagle Rock; Middle Plateau, 21° at Salt Lake City to 28° at Pioche and 40° at Winnemucca; Southern Plateau, 34° at Santa Fé to 46° at La Mesilla and 48° at Prescott; Northern Pacific Coast, 16° at Roseburg to 17° at Portland and 21° at Olympia; Middle Pacific Coast, 11° at San Francisco to 21° at Sacramento and 31° at Red Bluff; South Pacific Coast, 28° at Los Angeles to 32° at Visalia and 48° at Campo.

Table of Comparative Minimum Temperatures for the Month of January, 1882.

State or Territory.	Minimum for January, 1882, Signal Service.		Lowest since Signal Service stations were opened—3 to 11 years.			Lowest from any other source.			
	Station.	Temp.	Station.	Temp.	Year.	Place.	Temp.	Year.	Length of Record.
Alabama.....	Montgomery.....	-24	Montgomery.....	14	1879	Huntsville.....	-9	1832 & 36	9 years.
Arizona.....	Prescott.....	-8	Prescott.....	-17	1880	Fort Canby.....	-20	1855	12 "
Arkansas.....	Little Rock.....	24	Little Rock.....	18	1881	Mount Ida.....	-10	1878	6 "
California.....	Campo.....	7	Campo.....	0	1880	Fort Crook.....	-20	1839	11 "
Do.....						Fort Bidwell.....	-18	1868	19 "
Colorado.....	Pike's Peak.....	-22	Pike's Peak.....	-39	1879	Fort Garland.....	-40	1873	29 "
Do.....	Denver.....	1				Fort Lyon.....	-28	1875	21 "
Connecticut.....	New Haven.....	-13	New Haven.....	-5	1881	Colebrook.....	-28	1881	9 "
Dakota.....	Fort Stevenson.....	-52	Pembina.....	-63	1877	Fort Randall.....	-44	1875	22 "
Delaware.....	Delaware Breakwater.....	10	Delaware Breakwater.....	12	1881	Fort Delaware.....	-5	1866	44 "
Do.....						Dover.....	0	1875	6 "
Dist. of Columbia.....	Washington.....	8	Washington.....	-14	1881	Washington.....	-14	1835	48 "
Florida.....	Jacksonville and Pensacola.....	32	St. Marks.....	18	1879	Fort Barrancas.....	10	1852	60 "
Georgia.....	Augusta.....	22	Atlanta.....	9	1879	Atlanta.....	8	1873	3 "
Do.....						Augusta Arsenal.....	-32	1837	48 "
Idaho.....	Eagle Rock.....	-30	Eagle Rock.....	-25	1881	Rock Island Arsenal.....	-29	1875	18 "
Illinois.....	Chicago.....	1	Champaign.....	-15	1881	Galesburg.....	-29	1864	8 "
Do.....						Arlington.....	-25	1879	2 "
Indiana.....	Fort Supply.....	-6	Fort Supply.....	-17	1881	Fort Gibson.....	-20	1857	54 "
Indian Territory.....	Dubuque.....	-5	Dubuque.....	-25	1881	Fort Madison.....	-33	1864	22 "
Iowa.....	Dodge City.....	0	Leavenworth.....	-20	1873	Fort Leavenworth.....	-30	1834	51 "
Kansas.....	Louisville.....	16	Louisville.....	-10	'75 & '79	Newport Barracks.....	-15		28 "
Kentucky.....	Shreveport.....	30	Shreveport.....	6	1879	Baton Rouge.....	8	1852	52 "
Louisiana.....	Eastport.....	-14	Eastport.....	-15	1878	Brunswick.....	-32	1850	52 "
Maine.....	Baltimore.....	7	Baltimore.....	-6	1881	Gardiner.....	-31	1814	46 "
Do.....	Boston.....	-13	Springfield.....	-14	1881	Fort McHenry.....	-15	1873	52 "
Maryland.....						Williamstown.....	-30	1835	55 "
Massachusetts.....	Alpena.....	-27	Escanaba and Marquette.....	-26	1881	Lunenburg.....	-29	1855	24 "
Do.....						Fort Brady.....	-42	1873	60 "
Michigan.....	St. Vincent.....	-42	St. Vincent.....	-44	1881	Ontonagon.....	-34	1861	11 "
Minnesota.....	Vicksburg.....	30	Vicksburg.....	10	1875	Fort Ripley.....	-44	1860	17 "
Mississippi.....	Springfield and St. Louis.....	6	St. Louis.....	-16	1875	Fayette.....	7	1879	5 "
Missouri.....	Terry's Landing.....	-36	Fort Benton.....	-55	1875	Ashly.....	-27	1879	4 "
Montana.....						Fort Benton.....	-38	1875	12 "
Do.....						Fort Ellis.....	-33	1872	14 "
Nebraska.....	North Platte.....	-8	North Platte.....	-27	1881	Camp Sheridan.....	-29	1879	4 "
Nevada.....	Winnemucca.....	-4	Winnemucca.....	-14	1879	Fort Ruby.....	-23	1864	5 "
Do.....						Fort Halleck.....	-22	1868	12 "
New Hampshire.....	Mount Washington.....	-39	Mount Washington.....	-46	1875	Dartmouth College.....	-34	1848	18 "
Do.....						Stratford.....	-33	1861	11 "
New Jersey.....	Barnegat.....	-1	Barnegat.....	-16	1875	Patterson.....	-13	1866	6 "
Do.....						Burnt Mills.....	-24	1875	3 "
New Mexico.....	Santa Fe.....	7	Santa Fe.....	-9	1881	Fort Wingate.....	-16	1864	20 "
New York.....	Albany.....	-14	Albany.....	-18	1878	Salem.....	-40	1840	20 "
Do.....						Gouverneur.....	-38	1835	40 "
North Carolina.....	Charlotte.....	18	Charlotte.....	11	'79 & '81	Ashville.....	-1	1879	4 "
Do.....									
Ohio.....	Cleveland.....	2	Kittysaw.....	11	1879	Jacksonburg.....	-25	1879	8 "
Do.....			Columbus.....	-30	1879	Marietta.....	-22	1852	58 "
Oregon.....	Umatilla.....	4	Umatilla.....	-25	1879	Fort Dalles.....	-23	1862	16 "
Pennsylvania.....	Erie.....	-2	Erie.....	-15	1875	Carlisle Barracks.....	-28	1873	37 "
Do.....						Philadelphia.....	-9	1866	113 "
Rhode Island.....	Newport.....	-8	Newport.....	3	1879	Fleming.....	-6	1861	6 "
Do.....						Providence.....	-17	1860	30 "
South Carolina.....	Charleston.....	26	Charleston.....	23	1879	Fort Adams.....	-13	1873	41 "
Do.....						Fort Montrie.....	14	1835	38 "
Tennessee.....	Knoxville.....	18	Knoxville.....	-14	1877	Charleston.....	16	1832	105 "
Texas.....	Fort Elliott.....	4	Pilot Point.....	-5	1879	Clarksville.....	-10	1879	8 "
Utah.....	Salt Lake City.....	2	Salt Lake City.....	2	'80 & '81	Fort Davis.....	-15	1873	28 "
Vermont.....	Burlington.....	-25	Burlington.....	-17	1879	Coalville.....	-17	1879	7 "
Do.....						Woodstock.....	-30	1875	8 "
Virginia.....	Chincoteague.....	8	Fort Whipple.....	-8	1881	Craftsburg.....	-25	1869	9 "
Washington Ty.....	Cofax.....	-8	Dayton.....	-2	1881	Wytheville.....	-6	1879	9 "
West Virginia.....	Morgantown.....	9	Morgantown.....	-6	1875	Fort Colville.....	-30	1862	21 "
Wisconsin.....	La Crosse.....	-11	La Crosse.....	-31	1875	Helvetia.....	-14	1879	6 "
Do.....						Embarrass.....	-40	1870	19 "
Wyoming.....	Cheyenne.....	-12	Cheyenne.....	-8	1875	Fort Howard.....	-30	1823	31 "
Do.....						Fort Winnebago.....	-29	1841	12 "
						Fort Sanders.....	-61	1875	13 "
						Fort Laramie.....	-10	1864	29 "



**Frosts.**—In the various districts they were reported on the following dates: New England, 1st to 8th, 10th to 31st; Middle Atlantic States, 1st to 8th, 10th, 11th, 12th, 14th, 15th, 17th to 26th, 28th to 31st; South Atlantic States, 1st to 5th, 22nd to 26th, 30th, 31st; Florida Peninsula, Cedar Keys, 2d, 3d, 31st; East Gulf States, 2d, 3d, 23d; West Gulf States, 2d, 11th, 17th, 18th, 19th, 22d, 23d, 29th, 30th, 31st; Rio Grande Valley, 1st, 2d, 16th, 18th, 21st, 31st; Ohio Valley and Tennessee, 1st to 7th, 9th, 10th, 12th, 14th to 25th, 28th to 31st; Lower Lake Region, 1st to 31st; Upper Lake Region, 1st to 31st; Extreme Northwest, 1st to 31st; Upper Mississippi and Missouri Valleys, 1st to 31st; Northern Slope, 1st to 31st; Middle Slope, 1st to 6th, 8th to 31st; Southern Slope, 12th, 16th to 19th, 22d, 23d, 29th, 30th, 31st; Southern Plateau, 1st, 2nd, 4th to 31st; Middle Plateau, 1st to 4th, 8th, 9th, 10th, 13th to 31st; Northern Plateau, 3d, 7th, 12th, 13th, 15th, 16th, 19th to 25th; North Pacific Coast region, 9th to 12th, 15th to 22d, 25th, 27th to 30th; South Pacific Coast region, 1st, 3rd to 23d, 25th to 31st.

**Ice.**—Regarding its formation in the northern sections, this subject is considered elsewhere in the REVIEW under the head of *Ice in Rivers and Harbors*. The following are exceptional cases of ice formation in the southern sections of the country: Augusta, Ga., 2d, 23d; Jacksonville, Fla., 2d; Sloop Point, N. C., 2d; Portsmouth, N. C., 2d, 3d, 23d; Pensacola, Fla., 2d; Indianola, 17th; Victoria, Tex., 17th; Cuero, Tex., 17th, 19th; Mason, Tex., 17th, 19th; Eagle Pass, Tex., 17th; Tucson, Ariz., 18th; Florence, Ariz., 9th, 10th, 11th; Los Angeles, Cal., 27th; San Diego, Cal., 29th; Red Bluff, Cal., 9th, 10th to 14th, 18th, 24th; Visalia, Cal., 11th, 12th, 13th; Point San José, Cal., 13th, 14th; St. Augustine, Fla., 2d, very thin.

**Low Temperatures.**—The following are notable instances of extremely cold weather in various portions of the country attending the development and progress of areas of high barometer. *California*: San Jose, 13th, weather excessively cold during the past three days. Marysville, 13th, "phenomenally cold weather" for past two days; during the night of the 12th ice formed in gutters sufficient to bear a man's weight; temperature 9° below freezing. North San Juan, 13th, coldest weather for many years past; temperature 10° to 14° below freezing. Stockton, 13th, coldest weather for many years; ice one inch thick near the town. Fresno, 13th, weather for past 48 hours coldest ever experienced; ice formed during night, and in shady places remained all day; temperature 21° above zero. San Buenaventura, 13th, weather extremely cold; lambs and sheep dying from exposure. Los Angeles, 13th, severest weather ever known in southern California; "hills all around the city, down almost to the plains, white with snow." Merced, 13th, coldest weather for several years; ice formed more than one half inch in thickness. Alta, 13th, minimum temperature 22° below freezing; reservoirs frozen sufficient to permit skating; all mining ditches frozen rendering them temporarily useless. Yreka, 13th, minimum temperature 25° below freezing; coldest weather for several years. Campo, 12th, minimum temperature 6°.5, lowest for several years. San Geronimo, month remarkable for continued low temperatures; minimum temperature 19° on the 12th, lowest for many years. *Canada*: Parry Sound, 24th, —38°. Saugeen, 24th, —16°. Port Stanley, 24th, —10°. Toronto, 24th, —18°. Kingston, 24th, —19°. Montreal, 24th, —26°. Anticosti, 24th, —16°. Quebec, 24th, —26°. *Connecticut*: Hartford, 24th, 10° to 18° below zero, and in the surrounding towns as low as —20°. Southington, 25th, minimum temperature —14°, coldest day in past 25 years. *Massachusetts*: Boston, 24th, reports from different parts of New England show the thermometer to have fallen from 10° to 37° below zero. Worcester, 24th, coldest weather for past 12 years; in various parts of the city, thermometer from 12° to 20° below zero; in some portions of the country, the temperature fell to —26°. *Missouri*: St. Joseph, 16th, coldest day of the season; temperature 5° above zero. Carrollton, 16th, lowest temperature yet recorded for the season. Joplin, 16th, coldest of the season. Carthage, 16th, coldest of

the season. *Montana*: Fort Missoula, 29th, minimum temperature —31°, lowest since station was opened. *New Brunswick*, St. Johns, 18th, minimum temperature —28°, weather exceedingly severe. *Nevada*: Halleck, 12th, coldest weather for several years; temperature 30° below zero. Wells, 12th, exceedingly cold weather; temperature 30° below zero. Elko, 12th, temperature 25° below zero. Carlin, 12th, temperature 27° below zero; coldest weather ever experienced here. *New Jersey*: Long Branch, 24th, temperature —8°; preparations made for cutting ice. Red Bank, 24th, North Shrewsbury river frozen over; coldest weather for several years. *New Hampshire*: Colbrook, 24th, weather almost unendurable for the past two days. Portsmouth, 24th, temperature —24°; several vessels put into lower harbor, heavily encased in ice and unable to proceed further; crews suffered intensely from extreme cold and, in some cases, were frost-bitten; fishermen report the most "intense weather" at sea that it has ever been their lot to experience. Contoocookville, 24th and 25th, minimum temperature —15°; coldest days during the past 11 years. *Rhode Island*: Providence, 24th, coldest day of the season; thermometer from 10° to 15° below zero. Newport, 24th, coldest weather for past 10 years, temperature —6°; public schools closed, as it was found impossible to heat them. *New York*: Norwich, 24th, —33°; Poughkeepsie, 24th, all points along the river and from the interior of the river counties, reported the experience of intense cold; thermometer 16° to 20° below zero. Rochester 24th, —7°. Saranac Lake, 24th, —40°. Plattsburgh, 24th, —25°. Keeseville, 24th, —24°. Port Henry, 24th, —22°. Ticonderoga, 24th, —25°. Whitehall, 24th, —35°. Glen's Falls, 24th, —26°. Lake George, 24th, —25°. Saratoga, 24th, —36°. *Vermont*: Burlington, 24th, maximum temperature —4°, minimum temperature —24.8°; coldest day since 1857.

#### PRECIPITATION.

The general distribution of rain-fall over the United States and Canada for the month of January, 1882, is exhibited upon chart No. III from the reports of over 500 stations. From the table in the left-hand corner of the chart is obtained a monthly average for each of the various districts, determined from the records of Signal Service stations, covering a period of several years, to which is subjoined a comparison of the present month with such averages. Upon comparison with the chart, the tabulated averages show four very irregular areas of excess and deficiency. The former condition prevails and the areas embrace the entire eastern portion of the country, except the South Atlantic States and the Florida Peninsula, while to the west of the Mississippi they include the Extreme Northwest, Middle and Southern Slopes, Western Gulf States, Rio Grande Valley, and the Southern and Northern Plateaux. The departures of excess range from 0.11 inch in the Lower Lake Region to 9.92 inches in Tennessee. The excess in this State, for the present month, is the largest and most remarkable since the opening of Signal Service stations. The most serious floods have resulted from this marked and sudden increase of precipitation, and the consequent damage to property has been almost without precedent. The areas of deficiency are comparatively small and widely separated, and the departures range from 0.11 inch in the Middle Plateau to 4.42 inches in the Middle Pacific Coast region. The deficiency on the Pacific coast, especially in the two northern districts, is very large and quite unusual for the month. As a means of interesting comparison, the following maximum departures from the normal are given for each year since 1873, together with the corresponding districts: 1874, large excess, Lower Lake region; 1875, +3.02 inches, South Atlantic States; 1876, +3.15 inches, Ohio Valley and Tennessee, and —2.15 inches, South Atlantic States; 1877, —1.50 inches, Pacific Coast Regions, and —0.95 inch, Western Gulf States; 1878, +3.76 inches, Middle and South Pacific Coast Regions, and +2.17 inches, New England; 1879, +3.43 inches, Tennessee, and —2.12 inches, Eastern Gulf States; 1880, +6.21 inches, Portland, Or., —3.05 inches, Eastern Gulf States, and —2.45 inches, Middle and South Pacific Coast Regions; 1881, +3.80

inches, Florida Peninsula and +3.62 inches, Eastern Gulf States.

*Deviations from Average Precipitation.*—Under this heading departures exhibited by the reports from regular Signal Service stations are shown in the table of comparative monthly rainfalls, as published in the lower left-hand corner of chart No. III. The following items of importance in connection with this subject are reported by Voluntary Observers: *California*: Rio Vista, monthly rainfall considerably below the average. *Connecticut*: Southington, monthly rainfall considerably above the average. *Illinois*: Riley, monthly rainfall 1.57 inches, or 0.27 inch below the average for the past 21 years. *Indiana*: Vevay, monthly rainfall considerably below the average. *Kansas*: Yates Centre, monthly rainfall 0.25 inch above the average for the past 2 years. Lawrence, monthly rainfall 0.70 or inch, 0.56 inch below the average for the past 14 years. Manhattan, monthly rainfall 0.42 inch, or 0.28 inch below the average for the past 22 years; the largest rainfall (2.35 inches) during this period occurred in 1878, and the lowest (0.05 inch) occurred in 1870. Wellington, monthly rainfall 1.05 inch, or 0.59 inch above the average for the past 3 years. *Iowa*: Clinton, monthly rainfall considerably below the average. *Maine*: Gardiner, monthly rainfall 3.56 inches, or 0.31 inch above the average for the past 46 years. *Maryland*: Fallston, monthly rainfall 6.63 inches, or 3.40 inches above the average for the past 11 years, and 1.63 inches more than the maximum January rainfall for that period, which occurred in 1877. Sandy Springs, monthly rainfall considerably above the average for the past 10 years. *Michigan*: Thornville, monthly rainfall considerably below the average. *Missouri*: St. Louis, Missouri Weather Service reports monthly rainfall slightly above the average for the past 45 years. *New Hampshire*: Contoocookville, monthly rainfall 3.10 inches, or 1.10 inch above the average for the past 12 years. *New York*: Palermo, monthly rainfall 2.95 inches, or slightly above the average for the past 29 years; the largest January rainfall, 5.30 inches, occurred in 1874, and the smallest, 1.50 inches, occurred in 1866 and 1869; the snowfall for January, 1882, is less than for any January during the past 29 years. North Volney, monthly rainfall 2.70 inches, or 0.56 inch below the average for the past 9 years. *Tennessee*: Ashwood, monthly rainfall largely above the average, and the heaviest for the past 20 years. *West Virginia*: Helvetia, monthly rainfall 9.50 inches, or 4.56 inches above the average for the past 6 years; Wytheville, monthly rainfall 7.08 inches, or 3.56 inches above the average for the past 16 years.

*Special Heavy Rainfalls.*—4th, College Hill, Ohio, 2.50 inches. 10th and 11th, Clarksville, Tex., 2.50 in 9 hours and 30 minutes. 11th, Murphy, N. C., 2.80. 12th, San Diego, Cal., 2.49; Poway, Cal., 3.79. 12th and 13th, Austin, Tenn., 3.00 in 30 hours. 15th, 16th and 17th, Murphy, N. C., 5.10. 16th, Memphis, 2.97; Lexington, Mo., 2.50. 20th and 21st, Austin, Tenn., 2.60 in 24 hours. 21st, Fayette, Miss., 3.00. 24th, Galveston, 2.60. 27th, Ashwood, Tenn., 2.60. 27th and 28th, Forest Hill, N. C., 2.90 in 25 hours. 28th, Knoxville, 2.97; Helena, Ark., 2.80.

*Largest Monthly Rainfalls, including Melted Snow.*—Austin, Tenn., 18.11 inches; Ashwood, Tenn., 18.10; Knoxville, 16.98; Murfreesboro, Tenn., 16.30; Chattanooga, 14.74; Nashville, Tenn., 14.49; Murphy, N. C., 13.95; Vicksburg, 13.83; Decatur, Ala., 13.70; Helena, Ark., 13.17; Memphis, 12.87; Fayette, Miss., 12.70; Cisco, Cal., 11.71; White Plains, N. Y., 11.50; Highlands, N. C., 11.32; New Ulm, Tex., 10.55; Helvetia, W. Va., 9.50; Colfax, Cal., 9.09; Shreveport, 9.08; Forest Hill, N. C., 8.90; Portsmouth, Ohio, 8.82; Paducah, Ky., 8.70; New Shoreham, R. I., 8.57; Clarksville, Tex., 8.50; Mt. Ida, Ark., 8.40; Little Rock, Ark., 8.17; Galveston, 8.15; Confluence, Pa., 7.90; Ft. Gaston, Cal., 7.72; Summit, Cal., 7.40; Green Springs, Ala., 7.36; College Hill, O., 7.25; Charlotte, N. C., 7.24; Mt. Washington, 7.20; Ft. Canby, Wash. Ter., 7.16; Washington, D. C., 7.09; Wytheville, Va., 7.08; Federalsburg, Md., 7.01; Ft. Stevens, Or., 6.95; Cape Henry,

Va., 6.92; New London, 6.90; Halifax, N. S., 6.84; Morgantown, W. Va., 6.78; Mobile, 6.77; Accotink and Johnstown, Va., 6.75; Atlantic City, 6.74; Weldon, N. C., 6.64; Fallston, Md., 6.63; Quebec, 6.58; Newport, R. I., 6.55; Evansville, Ind., 6.50; New Geneva, Pa., 6.48; Sandy Hook, 6.47; Vineyard, N. J., 6.45; Great Falls, Md., 6.44; Norfolk, Va., Atlanta, Ga., Poway, Cal. and Truckee, Nev., 6.40; Bowling Green, Ky., 6.39; West Chester, Pa., 6.38; Cairo, 6.35; Flemington, W. Va., 6.33; Atco, N. J., 6.32; Jacksonburg, Ohio, 6.30; Louisville, 6.29; Yarmouth, N. S., 6.21; New York, 6.15; Golconda, Ill., 6.05; Lenoir, N. C., 6.00.

*Smallest Monthly Rainfalls, including Melted Snow.*—Yankton, 0.04 inch; Mojave, Cal. and Ft. Meade, Dak., 0.05; Smithville, Dak., 0.08; San Simon, Ariz., 0.12; Huron, Dak. and Cheyenne, 0.14; Ft. Keogh, Mont. and Macon, Mo., 0.18; Ft. Randall and Rapid City, Dak., Golconda, Nev., Ft. Assinaboine, Mont. and Ft. Wallace, Kan., 0.20; Ft. Snelling, Minn., 0.22; Bismarck and Ft. Sully, Dak. and Corning, Mo., 0.23; Brunswick, Mo., 0.25; Ft. Buford, Dak., 0.26; Hannibal, Mo. and Punta Rassa, Fla., 0.30; Ft. Union, N. M. and Lemoore, Cal., 0.32; Deadwood, Dak. and Ft. Elliott, Tex., 0.33; Terrace, Utah, 0.35; Pioche, Nev., 0.38; Hot Springs and Browns, Nev., 0.39; Benson, Ariz., Ft. Custer, Mont., Camp near Presidio, Tex., Ft. Fetterman, Wyo. and Tecoma, Nev., 0.40; Manhattan, Kan., 0.42; Newhall, Cal. and Ft. Stevenson, Dak., 0.43; Burlington, Vt. and Ft. Supply, Ind. Ter., 0.44; Almoda, Wash. Ter., Blue Creek, Utah, Terry's Landing, Mont. and Genoa, Neb., 0.45; North Platte, Neb., 0.46; Northfield, Minn. and Santa Fe, N. M., 0.47; Ft. Totten, Dak. and Clinton, Iowa, 0.48; Oakland, Cal., 0.49; Ft. Yates, Dak., Ft. Ringgold, Tex., Minneapolis, Minn., Nora Springs, Iowa and Chillicothe, Mo., 0.50.

*Rainy Days.*—The number varied in New England from 18 to 26; Middle Atlantic States, 16 to 24; South Atlantic States, 11 to 24; Florida Peninsula, 7 to 8; East Gulf States, 13 to 22; West Gulf States, 9 to 24; Rio Grande Valley, 12 to 22; Ohio Valley and Tennessee, 13 to 27; Lower Lake Region, 16 to 25; Upper Lake Region, 11 to 22; Extreme Northwest, 6 to 19; Upper Mississippi Valley, 11 to 19; Missouri Valley, 4 to 10; Northern Slope, 5 to 14; Middle Slope, 3 to 11; Southern Slope, 3 to 15; Southern Plateau, 5 to 11; Middle Plateau, 9 to 14; Northern Plateau, 12 to 20; North Pacific Coast Region, 18 to 23; Middle Pacific Coast Region, 8 to 11; South Pacific Coast Region, 5 to 9.

*Cloudy Days.*—The number varied in New England from 7 to 24; Middle Atlantic States, 11 to 19; South Atlantic States, 6 to 23; Florida Peninsula, 1 to 4; East Gulf States, 9 to 23; West Gulf States, 3 to 22; Rio Grande Valley, 15 to 25; Ohio Valley and Tennessee, 16 to 23; Lower Lake Region, 13 to 22; Upper Lake Region, 6 to 16; Extreme Northwest, 3 to 8; Upper Mississippi Valley, 7 to 14; Missouri Valley, 4 to 13; Northern Slope, 3 to 13; Middle Slope, 0 to 6; Southern Slope, 6 to 17; Southern Plateau, 3 to 10; Middle Plateau, 4 to 11; Northern Plateau, 12 to 18; North Pacific Coast Region, 13 to 18; Middle Pacific Coast Region, 5 to 8; South Pacific Coast Region, 3 to 7.

*Snow.*—The dates on which snow fell in the various districts are as follows: New England, 1st to 31st; Middle Atlantic States, 1st to 7th, 9th to 22d, 24th to 29th, 31st; South Atlantic States, 1st, 2d, 4th, 5th, 6th, 13th, 17th, 22d, 25th, 29th, 30th, 31st; West Gulf States, 16th to 20th, 29th, 30th; Rio Grande Valley, 17th; Tennessee, 1st, 17th, 30th, 31st; Ohio Valley, 1st to 6th, 10th to 13th, 15th to 25th, 29th, 30th, 31st; Lower Lake Region, 1st to 4th, 6th, 7th, 9th to 17th, 19th to 25th, 29th, 30th, 31st; Upper Lake Region, 1st to 29th; Extreme Northwest, 1st, 3d, 4th, 5th, 7th, 8th, 12th, 13th, 17th to 21st, 23d, 24th, 27th, 30th, 31st; Upper Mississippi Valley, 1st to 6th, 8th, 10th to 16th, 18th, 20th, 21st, 23d to 26th, 28th, 30th, 31st; Missouri Valley, 1st to 5th, 8th, 10th, 12th, 13th, 15th to 18th, 21st, 23d, 24th, 26th, 27th, 30th, 31st; Northern Slope, 1st to 28th, 30th, 31st; Middle Slope, 4th, 7th to 12th, 15th to 18th, 24th, 25th, 29th, 30th; Southern Slope, 16th, 18th, 29th,



30th; Southern Plateau, 7th to 20th, 24th, 25th, 26th, 28th, 29th, 30th; Middle Plateau, 3d, 4th, 6th to 15th, 18th, 19th, 23d to 27th, 30th, 31st; Northern Plateau, 1st, 3d to 7th, 9th to 14th, 16th, 18th, 19th, 20th, 23d to 31st; North Pacific Coast Region, 8th, 10th, 11th, 25th, 26th, 27th, 30th; South Pacific Coast Region, 12th to 15th. Particularly heavy or remarkable snow-falls were reported as follows: Los Angeles, Cal., 13th, hills all about the city white with snow. In the San Geronio Pass, two special freight trains were blockaded. The cuts in the Pass were filled to a depth of from six to eight feet with drifted snow. Beyond the Pass, on the Colorado desert, it rained heavy all night. Riverside, San Bernardino Co., Cal., 13th, snow five inches and still falling; good sleighing in the orange groves. Tucson, Ariz., 12th, very heavy snow during the night on the desert west of station. 13th, fierce snow storm raged in the mountains. Campo, Cal., 13th, snow fell to the depth of 20 inches; a brisk easterly wind prevailed at the time, which was remarkable owing to the fact that winds from that point are very seldom accompanied by precipitation; "all communication with the outside world cut off." 14th, ceased snowing at 10.20 a. m. 15th, nearly three feet of snow on the ground; many drifts eight feet deep; most remarkable storm ever known here; hundreds of birds were killed by exposure and stock suffered severely. 16th, all communication still cut off. 18th, snow slowly disappearing; reports from surrounding country show great losses in stock; roads still impassable. 19th, snow slowly disappearing. Petersburg, Va., 1st, snow fell to the depth of 10 inches; trains delayed and all traffic suspended. Gore, Ohio, 4th, trains delayed and travel of all kinds generally impeded. Circleville, Ohio, 4th, all railroad traffic suspended. Cincinnati, 4th, snow fell to a depth of 10 inches, seriously impeding travel. South Lee, Mass., 31st, very heavy storm continuing for 24 hours, snow fell to a depth of 25 inches; all communication seriously interfered with. Worcester, Mass., 31st, heaviest snow for years. At many places throughout the western portion of the state it fell to the depth of from 20 to 25 inches on the level. Great obstruction to travel, particularly on railroads; heavy snow plows used night and day to keep the tracks clear. Sherman, Tex., 16th, snow and sleet all day. Fredonia, Kan., 16th, severe snow blizzard, most violent for several years; wind from the north estimated at 40 miles per hour. Shreveport, La., 29th, snowed furiously from 2.25 to 2.30 p. m., the flakes being remarkably large. San Geronio, Cal., 12th, remarkable fall of snow in the surrounding country. From San Bernardino eastward to the edge of the desert and from San Diego southward, snow fell to a depth of from 4 to 15 inches. There is no record of any such storm in former years, but some of the old Mexican inhabitants speak of a similar storm as occurring some 50 years ago. The storm was further noteworthy from the fact that it came from the east and was accompanied by a violent gale from that quarter, whereas the east wind is usually remarkable for its entire want of moisture.

**Largest Monthly Snow-falls.**—Cisco, Cal., 81 inches; Summit, Cal., 65.5; Truckee, Nev., 62; Mt. Washington, about 54; Worcester, Mass., 53; Eagle Rock, Idaho, 44.1; Amherst, Mass., 40; Boca, Nev., 30; Cornish, Me., 36.5; Alpena, Mich., 36; Dyberry, Pa., 35; Antrim, N. H., 33; Springfield, Mass., about 32; Lunenburg, Vt., 31.5; Gardiner, Me., 31.2; Ardenia, N. Y., Grafton, Auburn and Contoocookville, N. H., and Rowe, Mass., 31; Somerset, Mass., and Orono, Me., 30; Milton, Pa., 29.5; Catawissa, Pa., 28.6; South Orange, N. J., 28.2; Dexter, Me., 28; Eastport, Me., and Thatcher's Island, Mass., about 27; Escanaba, about 26; Wells, Nev., 25.5; Prescott, Ariz., 25.3; New York City, about 25; Westborough, Mass., 25; Deer Park, Md., 24.7; Oswego, 24.6; Fall River, Mass., 24.5; Paterson, N. J., 24.3; Stratford, Vt., 23; Boston, about 23; Chester, Pa., 21.7; Flushing and White Plains, N. Y., and Colfax, Cal., 21; Woodstock, Vt., 20.5; Fallston, Md., Alta, Cal., and College Hill, O., 20; Williamsport, Pa., about 20; Johnstown, N. Y., 19.4; Emmitsburg, Md., and Vevay, Ind., 19; Grand Haven, 18.9; Southington, Conn., 18.5; Jacksonburg, O., and

New London, Conn., about 18; Pike's Peak, 17.8; Northport, Mich. and Rising Sun, Ind., 17.5; Albany, N. Y., and Sandy Springs, Md., 17; Pittsburg, about 17; Newport, Vt., 16.7; San Geronio, Cal., 16.5; Silver City, N. M., 16.3; Meadville, and Germantown, Pa., and Cumberland, Md., 16; Baltimore, about 16; Flemington, W. Va., 15.2; Cincinnati, 15.1; Phillipsburg and Somerville, N. J., Portsmouth, O., and Battle Mountain, Nev., 15; Johnstown, Va., 14.7; Elko, Nev., 14.5; Columbus, O., about 14.5; Princeton, N. J., 14.2; Wellsburg, Pa., and Halleck, Nev., 14; Erie, 13.8; Helvetia, W. Va., 13.7; Charleston, Ill., and Waterburg, N. Y., 13.5; Port Huron, about 13.5; Moorhead, Minn., 13.4; Carlin, Nev., 13; Fallsington, Pa. and Palisade, Nev., 12.7; New Athens, O. and Neillsville, Wis., 12.5; Embarrass, Wis., Spiceland, Ind., Corinne, Utah, Bethel, O. and Accotink, Va., 12; Indianapolis, about 11.8; Weldon, N. C. and Cairo, 11.7; New Shoreham, R. I., 11.6; Woodstock, Md., Vineland, N. J. and Logan, Ia., 11; Wellsburg, W. Va., 10.7; Wythville, Va., Promontory, Utah, Ft. Missoula, Mont., Winnemucca, Nev. and North Lewisburg, O., 10.5; Eola, Or., Kelton, Utah, and Colton, Cal., 10.

**Depth of Snow on Ground at the end of Month.**—*Arizona:* Prescott, 8 inches. *Arkansas:* Mt. Ida, 4 inches; Little Rock, 5 inches. *California:* San Geronio, 4½ inches. *Colorado:* Pike's Peak, 6 inches. *Connecticut:* Southington, 14 inches; New London, 4 inches; New Haven, 8 inches. *Dakota:* Ft. Stevenson and Huron, ½ inch. *District of Columbia:* Washington, 6 inches. *Idaho:* Eagle Rock, 8½ inches. *Illinois:* Anna, 3 inches; Champaign, ½ inch; Swanwick, 2 inches; Springfield, ¾ inch; Cairo, 5 inches. *Indiana:* Vevay, 5 inches; New Corydon, 2 inches; New Harmony, 7 inches; St. Meinrad, 5½ inches; Spiceland, 3 inches; Rising Sun, 9 inches; Indianapolis, 2½ inches. *Indian Territory:* Fort Gibson, 2.4 inches. *Iowa:* Guttenburg, trace; Nora Springs, ¼ inch. *Kansas:* Yates, Centre, Holton and Independence, 1 inch; Council Grove, 1½ inches; Wellington, 3 inches; Dodge City and Leavenworth, ½ inch. *Kentucky:* Bowling Green, 5½ inches; Louisville, trace. *Maine:* Orono, 10 inches; Gardiner, 15 inches; Eastport, 8 inches. *Maryland:* Woodstock, 11 inches; Deer Park, 6 inches; Sandy Springs, 5½ inches; Cumberland, 10 inches; Federalsburg, 2½ inches; Fallston, 8 inches; Baltimore, 4 inches. *Massachusetts:* Springfield, 22 inches; Fall River, 7 inches; Somerset, 14 inches; Rowe, 15 inches; Amherst and Worcester, 26 inches; Thatcher's Island, 15 inches; Boston, 6 inches. *Michigan:* Northport, 5 inches; Battle Creek, ½ inch; Marquette, 1½ inches; Escanaba, 4 inches; Alpena, 3 inches. *Minnesota:* Northfield, 2½ inches; St. Vincent, 1½ inches; St. Paul and Duluth, less than one inch; Moorhead, 8 inches. *Missouri:* Springfield, 1 inch; St. Louis, ½ inch. *Montana:* Ft. Assinaboine, 1 inch; Ft. Missoula, 1½ inches; Ft. Benton and Custer, 2 inches; Ft. Shaw, about 1 inch. *Nebraska:* De Soto, trace. *Nevada:* Carson City, 5 inches; Winnemucca and Pioche, 3 inches. *New Hampshire:* Grafton, 20 inches; Auburn, 18 inches; Contoocookville, 10 inches; Mt. Washington, 17 inches. *New Jersey:* Vineland, 2 inches; Freehold, 4½ inches; South Orange, 12 inches; Princeton and Phillipsburg, 6 inches; Somerville, 5 inches; Sandy Hook, 2½ inches; Atlantic City, trace. *New Mexico:* Santa Fe, trace to 6 inches; Silver City, 1 inch. *New York:* Johnstown, 4 inches; Ardenia, 14 inches; Flushing, 10 inches; Cooperstown, 4 inches; Waterburg, 1 inch; Palermo, trace; White Plains, 4 inches; Oswego, trace; New York City, 13 inches; Albany, 4½ inches. *North Carolina:* Murphy, 1 inch; Highlands, ½ inch. *Ohio:* College Hill, 5 inches; Westerville and North Lewisburg, 2 inches; Ruggles, 1 inch; New Athens, 5½ inches; Jacksonburg, 5 inches; Wooster, 1½ inches; Columbus, 3½ inches; Cincinnati, 3½ inches. *Oregon:* Umatilla, ½ inch; Eola, 2 inches. *Pennsylvania:* Dyberry, 22 inches; Milton, 17½ inches; Fallsington and West Chester, 8 inches; New Castle, 3 inches; Meadville, 2½ inches; Catawissa, 15 inches; Wellsboro, 6 inches; Pittsburg, 5 inches; Philadelphia, 2 inches; Williamsport, 10 inches. *Rhode Island:* New Shoreham, 6 inches;

Newport, 5 inches. *Tennessee*: Ashwood, 2½ inches; Nashville, 2 inches; Memphis, 4 inches; Chattanooga, 1 inch. *Texas*: Henrietta, 1½ inches; Denison, trace. *Utah*: Coalville, 4 inches; Salt Lake City, 1 to 3 inches. *Vermont*: Newport, 3 inches; Strafford and Woodstock, 6 inches; Burlington, ½ inch. *Virginia*: Accotink and Wytheville, 5 inches; Lynchburg, 3½ inches. *Washington Territory*: Dayton, 3 inches; Olympia, 2 inches. *West Virginia*: Morgantown and Wellsburg, 5 inches; Helvetia, 4 inches; Flemington, 2 inches. *Wisconsin*: Neillsville, 7 inches; Embarrass, 5 inches; La Crosse, 3½ inches; Madison, trace.

*Rain or Snow from a Cloudless Sky*.—Burlington, Vt., 2d, 4th, light snow; 22d, light snow at intervals during the day and night. Mobile, 10th, 7.45 p. m., light rain, lasting about five minutes, during which 0.01 inch fell. Buffalo, 22d, light snow. Dubuque, Ia., 2d, light snow from 8.05 to 8.25 a. m.; Ardenia, N. Y., 24th, between 4 and 5 p. m.

*Hail*.—Portland, Or., 25th; San Francisco, 24th, during a heavy shower of rain at 3.40 p. m., hail was reported to have fallen in several sections of the city. Sacramento, Cal., 31st. Red Bluff, Cal., 23d, hail-stones size of peas; 25th, from 5.10 to 5.15 p. m., size of peas; Visalia, Cal., 10th, 6 p. m., a sudden and heavy fall of hail lasting 10 minutes; Fort Canby, Wash. Ty., 31st.

*Sleet*.—The dates on which sleet fell in the various districts are as follows: New England, 1st, 6th, 8th to 11th, 13th, 16th, 26th, 27th; Middle Atlantic States, 4th, 5th, 8th to 12th, 16th to 19th, 22nd, 25th, 26th, 28th, 31st; South Atlantic States, 1st, 25th, 26th, 30th, 31st; East Gulf States, 29th; West Gulf States, 16th, 17th, 18th, 29th; Rio Grande Valley, 17th; Ohio Valley and Tennessee, 3rd, 4th, 6th, 10th, 12th; 13th, 15th to 18th, 24th, 25th, 30th, 31st; Lower Lake Region, 6th, 10th, 12th, 21st, 25th; Upper Lake Region, 6th, 7th, 8th, 13th, 26th; Upper Mississippi Valley, 4th to 7th, 10th, 12th, 16th, 20th, 24th, 26th; Missouri Valley, 4th, 10th, 16th, 26th, 30th; Northern Slope, North Platte, 12th; Middle Slope, 10th, 12th, 16th, 20th, 24th, Southern Slope, 16th, 17th, 20th; Southern Plateau, Tucson, 16th; Middle Plateau, Pioche, 24th; Northern Plateau, Fort Missoula, Mont., 2nd, and Dayton, Wash. Ter., 25th.

#### RELATIVE HUMIDITY.

The percentage of mean relative humidity for the month ranges as follows: New England, from 68 to 77; Middle Atlantic States, 69 to 87; South Atlantic States, 70 to 87; Florida Peninsula, 76 to 79; East Gulf States, 75 to 84; West Gulf States, 71 to 90; Rio Grande Valley, 78 to 91; Ohio Valley and Tennessee, 73 to 83; Lower Lake Region, 71 to 86; Upper Lake Region, 70 to 87; Extreme Northwest, 66 to 95; Upper Mississippi Valley, 63 to 78; Missouri Valley, 64 to 72; Northern Slope, 56 to 75; Middle Slope, 47 to 74; Southern Slope, 48 to 81; Southern Plateau, 54 to 64; Middle Plateau, 53 to 72; Northern Plateau, 73 to 85; North Pacific Coast Region, 83 to 85; Middle Pacific Coast Region, 68 to 70; South Pacific Coast Region, 57 to 70. *High stations* report the following percentages not corrected for altitude: Santa Fe, 67.9; Denver, 56.8; Pike's Peak, 77.4; Mt. Washington, 86.1.

#### WINDS.

The prevailing winds during the month of January, 1882, at Signal Service stations, are shown on chart No. II, by arrows which fly with the wind. In the Middle Atlantic States and New England the winds are *northwesterly*; in the South Atlantic States, *southwesterly*; in the Gulf States and Florida Peninsula, *southerly*; in the Ohio Valley and Tennessee, *south-west to north-west*; in the Lake Region, *southwesterly*; in the Upper Mississippi and Lower Missouri Valleys and in the Red River of the North Valley, *southerly*; in the Northern Slope, *northwesterly*; in the Middle and Southern Slopes, *south to west*; in the Plateau Regions, *variable*; in the North Pacific Coast Region, *southerly* and in California, *northerly*.

*Total Movements of the Air*.—The following are the largest total movements at Signal Service stations: Mt. Washington,

28.892 miles; Pike's Peak, 19.172; New Shoreham, R. I., 13.733; Delaware Breakwater, 13.423; Thatcher's Island, Mass., 12.602; Sandy Hook, 11.955; Hatteras, 11.501; Kittyhawk, 11.436; Cape May, 11.310; Sandusky, 10.841; Rochester, 10.793; Buffalo, 10.651; Barnegat, 10.557; Grand Haven, 10.292; Indianola, 10.135; Ft. Shaw, Mont., 10.039; Cape Henry, Va., 9.879; Newport R. I., 9.612; Eastport, 9.386; Chincoteague, Va., 9.301; Portsmouth, N. C., 9.280; Oswego, 9.125; Champaign, Ill., 9.070; Milwaukee, 8.962; Macon, N. C., 8.960; Erie, 8.908; Huron, Dak., 8.829; Boston, 8.742; Cleveland, 8.609; Galveston, 8.597; Detroit, 8.536; Dodge City, 8.500; Cheyenne, 8.328; Ft. Elliott, Tex., 8.301; Burlington, Vt., 8.185; Port Huron, 8.160; Marquette, 8.134; Atlanta, 8.088; North Platte, 8.046; Ft. Assinnaboine, Mont., 8.040. The *smallest* are: La Mesilla, N. M., 1.221; Rio Grande, Tex., 1.236; Roseburg, Or., 1.762; Ft. Missoula, Mont., 1.800; Salt Lake City, 2.100; Florence, Ariz., 2.177; Lynchburg, 2.338; Silver City, N. M., 2.541; Tucson, Ariz., 2.812; Boise City, Idaho, 2.863.

*High Winds*.—The following are maximum velocities, with direction at time of occurrence, for the various dates on which 50 miles per hour was exceeded, on the summit of Mt. Washington: 100 miles, NW., 2d; 70, NW., 3d; 88, N., 4th; 68, S., 6th; 82, NW., 7th; 92, W., 8th; 100, NW., 9th; 80, NW., 10th; 100, NW., 11th; 88, NW., 12th; 100, W. and SW., 13th; 110, NW., 14th; 120, NW., 15th; 65, NW., 16th; 97, NW., 17th; 88, W., 18th; 60, NW., 19th; 60, NW., 20th; 60, SW., 21st; 120, NW., 22d; 88, NW., 23d; 96, NW., 24th; 67, NW., 25th; 65, NW., 26th; 126, NW., 27th; 72, SW., 28th; 120, NW., 29th; 116, NW., 30th; 58, NW., 31st. On the summit of Pike's Peak the following maximum velocities were reported: 62 miles, NW., 1st; 54 W. and NW., 5th; 50, SW., 6th; 50, NW., 21st; 54, SW., 24th; 52, W., 26th. Other stations reporting velocities of 50 miles per hour or over are as follows: Ft. Stevenson, Dak., 56, NW., 17th; Indianola, 53, N., 16th; Grand Haven, 50, NW., 26th; Sandusky, 51, W., 22d; Buffalo, 51, SW., 27th; Rochester, 56, W., 27th; Champaign, Ill., 52, W., 26th; Thatcher's Island, Mass., 52, NE., 2d, and 57, NW., 27th; New Shoreham, R. I., 50, N., 1st and 2d, and 55 NE., 31st; Sandy Hook, 54, E., 31st; Cape May, 54, NW., 14th, 63, W., 22d, and 52, NW., 29th; Delaware Breakwater, 52, NW., 22d and 29th; Cape Henry, Va., 52, NW., 1st.

*Local Storms*.—Most of the following storms attended the development and progress of low areas Nos. XII and XIII. The latter rapidly succeeded the former and pursued its general course, and the partial restoration of atmospheric equilibrium between the passage of the two storm centres caused sudden and violent westerly gales at many points in the northern districts. Ventura Co., Cal., 12th, very violent wind storm (said to be a tornado) occurred in the Ojai valley, destroying houses and barns and uprooting and breaking off the strongest trees. Wilmington, Cal., 12th, most terrible storm for many years, accompanied by a blinding fall of snow and sleet; several vessels dragged anchor in the harbor, and one of them became a total wreck. Oakland, Cal., 13th, heavy northerly gale, signs destroyed, fences blown down, trees uprooted, wind mills dismantled and several houses damaged. Martinsburg, N. Y., 26th, very violent wind storm, over 25 buildings more or less demolished. Lowville, N. Y., many buildings unroofed and some entirely demolished. Harrisburg, N. Y., 27th, barns unroofed. Greig, N. Y., 27th, barns and houses unroofed and other property damaged. Constableville, N. Y., 27th, barns unroofed, fences blown down and trees uprooted. High Market, N. Y., 27th, several buildings unroofed. San Diego, Cal., 12th, most remarkable storm since 1847, a period of 34 years; continuing for 38 hours, it gave the largest rainfall of any one storm in the month of January during the above period, and the largest but two of all the storms recorded. It was especially remarkable as being the coldest storm of which there is any record. On the morning of the 14th snow-flakes were observed, melting as fast as they fell, a phenomenon



never before noted at this station, which fact is verified by persons who have resided in San Diego for the past 40 years. Very rarely and at long intervals light snow has been seen on the summit of San Miguel Mountain, 15 miles distant. Snow is frequently seen on the Cuyamaca Peaks, 45 miles to the northeast, and occasionally on Lyons peak, 35 miles eastward. But accompanying this storm, snow varying in depth from two to five inches was reported from the low hills at El Cayon, Poway, Bernardo, and other points within 15 to 25 miles of station, "where such a thing was never before experienced." The magnitude of the fall of rain and snow was such, that 12 hours from the commencement of the storm San Diego river began flowing into False Bay, a "change almost unprecedented." In this connection the following comparative statement of January rainfalls will be found of interest: 1871, 0.69 inch; 1872, 0.99; 1873, 0.44; 1874, 3.11 inches; 1875, 2.38; 1876, 2.47; 1877, 1.05; 1878, 1.45; 1879, 3.54; 1880, 0.61; 1881, 0.52; 1882, (to date, January 13th) 3.02 inches. Oswego, N. Y., 27th, about 5 a. m., severe wind storm, considerable damage to telegraph and telephone wires; buildings unroofed, fences and trees blown down and much other damage caused; severest gale experienced for several years. Thompsonville, Conn., 27th, several buildings unroofed and considerable damage caused to farmers in the surrounding country. Stamford, Conn., 27th, one large building demolished and much damage to trees, fences and houses. Brattleboro, Vt., 27th, trees uprooted and broken down and several buildings demolished. North Hinsdale, Vt., 27th, buildings unroofed and telegraph and telephone wires rendered useless. Chesterfield, Vt., 27th, buildings blown down and forest trees uprooted. Westfield, Mass., 27th, considerable damage to buildings, fences and shade trees. Joplin, Mo., 15th, very heavy wind storm, demolishing trees, fences and out-buildings. Troy, N. Y., 27th, heavy westerly gale, causing much damage to property. Lansingburg, N. Y., 27th, several buildings unroofed. Castleton, N. Y., 27th, buildings unroofed and other property considerably damaged. Mineville, N. Y., 27th, several buildings blown down and other property damaged. Wilmington, Vt., 27th, considerable damage to trees and buildings. Marlboro, Vt., 27th, very heavy wind storm, causing much damage to property. Keene, N. H., 27th, several buildings blown down and quite a number unroofed. Winchester, N. H., 27th, large number of barns unroofed and houses partially demolished. Greenfield, Mass., 27th, several buildings unroofed and blown down. Schools were closed from fear of damage to buildings. Holyoke, Mass., 27th, considerable damage to property by the unroofing of buildings and the destruction of trees and fences. Southwick, Mass., 27th, buildings unroofed and otherwise damaged. Lewiston, Me., 27th, considerable damage to windows, fences, signs, chimneys and church steeples. Burlington, Vt., 27th, heaviest wind storm for many years; great destruction of property by the unroofing and blowing down of buildings; large trees uprooted or broken off. The ice in Burlington bay and Lake Champlain was swept out of sight with "amazing rapidity." Much havoc took place in the various lumber yards. Pittsfield, Mass., 27th, 9 a. m., very heavy wind storm, unroofing buildings, destroying trees and causing considerable damage in the surrounding country. In the city business was almost entirely suspended, "horses and sleighs were blown prostrate as the gale struck them and the streets were strewn with large quantities of debris." Most violent storm since the "terrible tornado" of July 16th, 1879. Saratoga, N. Y., 27th, heavy wind storm during early morning proving very destructive in surrounding country. Rockland, Me., 27th, several buildings unroofed and some damage to shipping in harbor. Chelsea, Me., 27th, several buildings demolished. East Concord, N. H., 27th, considerable damage to property. Chicopee, Mass., 27th, bridge over the Connecticut river destroyed; several buildings damaged. Lynn, Mass., 27th, several buildings unroofed and otherwise damaged. Rochester, N. H., 27th, several buildings damaged and other property destroyed. Cheshire, Mass., 27th, heavy wind storm; steam engine house

and ice-houses, the property of the Housatonic Ice Company were blown down; several other buildings completely demolished. Loss to property over \$5,000. North Adams, Mass., 27th, three large brick buildings aggregating over 800 feet in length, belonging to the Zylorite Works, were completely demolished. Newburyport, Mass., 27th, several buildings unroofed and otherwise damaged. Nashau, N. H., 27th, very heavy wind storm, considerable damage to property. Springfield, Mass., 27th, heavy wind storm about 10 p. m., considerable damage in city and surrounding country. West Turin, N. Y., 27th, considerable property destroyed. Naumburg, N. Y., 27th, barns unroofed and other buildings badly damaged; loss of property in vicinity quite severe. The gale was accompanied by rain, which began about 2 p. m. "The western sky was very dark and immense dark masses of cloud passed rapidly from west to east during the storm." Rondout, N. J., 27th, houses and other buildings unroofed, fences demolished and trees uprooted; severest wind storm for several years. Along the line of the Ulster and Delaware R. R. a great many telegraph poles were "broken off or torn out of the ground." Ancram, Dutchess, Co., N. Y., 27th, large destruction of property in town and surrounding country. Winthrop, Me., 27th, heavy westerly gale; considerable damage to property. Ballston Spa, N. J., 27th, heaviest wind storm experienced for several years; much damage to property. Bloodville, N. J., 27th, very heavy wind storm; buildings damaged. Rock City, N. Y., 27th, heavy wind storm; considerable property destroyed. Wabash, Ind., 26th, buildings unroofed, trees and fences blown down. Fort Wayne, Ind., 26th, heavy westerly gale, damaging buildings and other property. Grand Haven, Mich., 26th, several buildings and other property damaged during a heavy westerly gale.

#### VERIFICATIONS.

*Indications.*—The detailed comparison of the tri-daily indications for January, 1882, with the telegraphic reports for the succeeding twenty-four hours, shows the general percentage of verifications to be 83.18 per cent. The percentages for the four elements are: Weather, 81.32; Direction of the Wind, 76.27; Temperature, 86.60; Barometer, 88.52 per cent. By geographical districts they are: For New England, 84.0; Middle Atlantic States, 88.0; South Atlantic States, 83.6; Eastern Gulf States, 82.1; Western Gulf States, 80.7; Lower Lake Region, 87.7; Upper Lake Region, 83.6; Tennessee and the Ohio Valley, 85.4; Upper Mississippi Valley, 81.9; Lower Missouri Valley, 76.7; Northern Pacific Coast Region, 83.3; Middle Pacific Coast Region, 82.1; Southern Pacific Coast Region, 85.3. There were 119 omissions to predict (40 being due to the absence of reports from the Pacific coast) out of 3,813, or 3.12 per cent. Of the 3,694 predictions that have been made, 198, or 5.36 per cent. are considered to have entirely failed; 200, or 5.42 per cent. were one-fourth verified; 437, or 11.83 per cent. were one-half verified; 231, or 6.25 per cent. were three-fourths verified; 2,628, or 71.14 per cent. were fully justified, so far as can be ascertained from the tri-daily reports.

*Cautionary Signals.*—97 Cautionary signals were displayed during the month of January, 1882, of which 94, or 96.90 per cent., were fully justified by winds of twenty-five miles per hour, or over, at or within a radius of 100 miles of the station. 109 Off-shore signals were displayed, of which 80, or 73.39 per cent., were fully justified; 94 or 86.23 per cent., were justified as to direction; 106, or 97.24 per cent., were justified as to velocity. Twenty-two Off-shore signals were changed from Cautionary. Two Northwest signals were displayed, both of which were fully justified. 208 signals of all kinds were displayed, of which 176, or 84.61 per cent. were fully justified. The above does not include signals ordered at 69 display stations, where the velocity is only estimated. 147 winds of 25 miles or over, were reported, for which no signals were ordered. 34 signals were ordered late.

#### NAVIGATION.

*Stage of Water in Rivers.*—In the table on the right-hand

side of chart No. III are given the highest and lowest stages of water as observed at Signal Service stations during the month of January, 1882. Except throughout the Ohio Valley and Tennessee, embracing the Ohio, Cumberland and Tennessee rivers, and a portion of the central Mississippi, the rivers have remained at a moderate stage throughout the month. In the rivers above named the changes have been remarkable, and in one instance unprecedented, as in the case of the Cumberland at Nashville, where the rise reached a point never before recorded, being, on the 22d, 54 feet and 7 inches above low-water mark, or 12 feet and 7 inches above the danger-line. The very serious floods accompanying the heavy rises in these rivers are fully described elsewhere in the REVIEW under the head of *Floods*. The Red river reached its highest stage at Shreveport on the 31st, water within 2 feet and 9 inches of the danger-line. The Arkansas reached its highest stage at Little Rock on the 18th and 19th. At most stations on the Missouri the river was frozen over throughout the month. The Mississippi above Dubuque, remained frozen; below that station the highest stage was reached, with few exceptions, on the 30th and 31st. At four stations the water rose above the danger-line, as follows: Cairo, 7 feet and 8 inches; Memphis, 11 inches; Vicksburg, 22 inches, and New Orleans, 1 inch. In the Ohio the highest stage was reached between the 15th and 28th, and all stations reported rises above the danger-line of from 18 to 27 inches. In the Cumberland, Tennessee, Monongahela and Savannah rivers the highest stages were reached between the 18th and 28th, and in the two former were above the danger-line from 112 to 151 inches.

*Ice in Rivers and Harbors.*—*Mississippi River*: Le Claire, Ia., 16th, river frozen over opposite city and at the head of the upper rapids; ice 10 inches thick. Keokuk, 1st, full of floating ice; steamers between this point and St. Louis gone into winter quarters; navigation closed; 3rd floating ice. Davenport, 1st to 7th, 9th to 27th, 30th, 31st, floating ice; 8th, 28th, river clear of ice. Burlington, Ia., 1st to 6th, 9th, 10th, 13th to 19th, floating ice; 7th, 11th, clear of ice. Dubuque, 1st, ferry boat stopped by the ice; 13th, frozen over; 18th, teams crossing on the ice. La Crosse, frozen over during the month. St. Paul, frozen over during the month. St. Louis, 1st to 4th, 6th, 9th, 10th, 20th, 22d, 30th, 31st, floating ice. Muscatine, Ia., 28th to 31st, river closed by ice. *Missouri River*: Yankton, frozen over during the month. Omaha, frozen over during the month. Leavenworth, 1st to 6th, 16th to 20th, 22d to 26th, 29th to 31st, floating ice; 7th, 21st, 27th, clear of ice. *Republican River*: Clay Centre, Kan., 28th, frozen over, ice eight inches thick. *Kennebec River*: Gardiner, Me., 2d, river closed by ice. *Yuba River*: Marysville, Cal., 13th, river full of floating ice; coldest weather for years. *Des Moines River*: Des Moines, 17th, river partly covered with ice. *Forest Lake*: Madison, Wis., 2d, frozen over. *Yellowstone River*: Terry's Landing, Dak., 13th, river closed by ice. Fort Keogh, 5th, river frozen over. *Big Horn River*: Fort Custer, 9th, river closed by ice. *Embarras River*: Charleston, Ill., 5th, river frozen over; 24th, ice 3 to 5 inches in thickness. *Rock River*: Rockford, Ill., 1st, river frozen solid. *Sault St. Marie River*: Fort Brady, Mich., 1st, ice forming on river; 3d, river frozen over. *Lake Ontario*: Madison Barracks, N. Y., 2d, bay frozen over. *Niagara River*: Buffalo, 4th, frozen over; 26th, ice breaking up; 27th, gorging. Fort Niagara, 23d, 31st, river full of floating ice. *Lake Huron*: Port Huron, 23d, Lake Huron Bay covered with ice-floes; 24th, ice bridge formed across the bay from Fort Gratiot Light-house to Point Edwards; 27th, ice bridge broken. Alpena, 1st, Thunder Bay frozen over, navigation closed. *Grand River*: Grand Haven, 4th, frozen over; 14th, full of ice; 25th, frozen over with exception of channel, which was kept open by steamers. *Lake Superior*: Duluth, 4th, lake full of broken ice as far as the eye could reach; 8th, clear of ice; 10th, frozen over 600 feet from the docks; 15th, opened during evening; 17th, frozen; 18th, ice disappeared; 20th, frozen; 21st, clear of ice; 22d, frozen; 28th, large fields of ice went out during storm; 31st, ice melting rapidly. *Thunder Bay River*: Alpena, 1st, frozen

over, navigation closed. *Hudson River*: Peekskill, N. Y., 24th, river frozen solid for many miles to the northward; "ice cutting very active everywhere north of Catskill." Albany, 1st, 3d, floating ice; 4th, river full of ice rendering navigation dangerous; 5th, navigation closed. Poughkeepsie, N. Y., 24th, steamer Daniel S. Miller, bound for New York, became fast in the ice off Cold Spring in the Highlands. New York, 5th, considerable floating ice in North Hudson River; 29th, floating ice in river and harbor; 4th, navigation on the upper Hudson closed in consequence of ice. In 1809 the river was open until January 19th; during the last 100 years, navigation continued later than December, only eleven times, the latest cessation occurring in 1801 when navigation did not close until the 3d of February. *Chincoteague Bay*: Chincoteague, 4th, 5th, floating ice in harbor; 24th, harbor partially frozen over, navigation obstructed; 25th, ice in harbor breaking up. *Core Sound*: Cape Lookout, 22d, frozen over. *Lake Michigan*: Milwaukee, 5th, lake frozen. Chicago, 3d, lake frozen; 8th, clear of ice. *Black River*: Port Huron, 1st, frozen over; 17th, ice 7 inches thick. *St. Clair River*: Port Huron, 2d, light floating ice; 4th, 5th, 17th, 18th, 19th, 22d, 23d, 24th, 27th, 29th, 30th, 31st, floating ice. *Maumee River*: Toledo, 2d, frozen over; 8th, ice breaking up; 13th, floating ice; 14th, frozen over. *Cuyahoga River*: Cleveland, 2d, frozen over; 4th, 5th, 18th, floating ice; 6th, clear of ice; 23d, frozen over; 25th, ice broken up by tugs. *Lake Erie*: Cleveland, 4th, 5th, 18th, lake full of ice as far as eye could reach. Erie, 1st, ice formed in harbor to a depth of 8 inches; 25th, ice breaking up causing considerable damage to the breakwater. *Lake Champlain*: Burlington, 5th, lake frozen between the docks; 23rd, navigation closed. *Monongahela River*: Pittsburgh, 4th, 25th, 26th floating ice; Morgantown, 4th, partly frozen over. *Detroit River*: Detroit, 2nd, floating ice. *Sandusky Bay*: Sandusky, 1st, frozen over during night, navigation suspended; 10th, ice breaking up; 12th, clear of ice; 14th, frozen over. *Penobscot River*: Bangor, 2nd, navigation closed. *Quinnipiac River*: New Haven, 4th, harbor and river frozen over. *Connecticut River*: New Haven, 4th, navigation closed, a later date than for past 40 years; steamer Granite State from New York to Hartford, caught in the ice at Lynn. Springfield, 4th, ice forming rapidly; 5th, river closed; 15th, ice melting and breaking up.

*Floods.*—The extraordinarily heavy rains in Tennessee and extending thence southwestward into the northern portions of the West Gulf States caused very serious floods and enormous destruction of property. The destructive work of high water as herein noted is confined to the last half of the month, and in several instances to the last week, which shows how sudden and extremely heavy must have been the precipitation. In many sections of the flooded district it has no parallel during the past 50 years. *Alabama*: Montgomery, 21st, river slowly falling, no special danger from the flood. Mobile, 19th, lower portion of the city inundated by the overflow of Tombigbee river. Tuscaloosa, 19th, river 56 feet above low water mark and the water still rising. Bridgeport, 20th, river remained stationary for several hours but commenced rising during the night; damage to property slight. Decatur, 21st, heaviest rain of the season; river 25 feet above low water mark and rising slowly; river six miles wide and lacks only three feet of reaching the high water mark of 1867. *Arkansas*: Hopefield, 28th, most of the town submerged; great destruction of property; loss to private parties very heavy. *Georgia*: Rome, 21st, the heavy rains of the past week caused rapid rises in all streams and in some cases serious floods. *Illinois*: Cairo, 21st, with two exceptions the Ohio river at this point was higher than at any time during the past ten years. At 4 p. m., river 45.6 feet above low water mark and rising slowly. The following are the dates and heights of the highest water at this station during the past ten years: 1872, April 20th, 29.2 feet; 1873, February 26th, 41.3 feet; 1874, April 26th, 47.4 feet; 1875, April 21st, 33.8 feet and August 8th, 45.1 feet; 1876, April 7th, 46.4 feet;



1877, April 15th, 40.6 feet; 1878, March 17th, 35.9 feet; 1879, January 26th, 36 feet; 1880, March 23d, 44.5 feet; 1881, April 20th, 45.9 feet; 1882, January 21st, 45.6 feet. *Louisiana*: New Orleans, 19th, high water reported from many sections of the State. The Atchafalaza river overflowed its banks submerging the adjacent low lands. The flood of Big Black river spread in every direction; about 30 miles of the Chicago, St. Louis and New Orleans R. R. under water; many culverts destroyed and much of the road bed washed away. 28th, a crevasse, 75 feet wide and 3 feet deep formed in the O'Brien levee, just below the Quarantine station; country flooded for a distance of two miles back. 29th, crevasse formed at Lockport, Bayou-la Fourche, gap 28 feet wide and 20 feet deep. *Mississippi*: Corinth, 20th, the tracks of the Memphis and Charleston R. R. submerged, and travel suspended. Canton, 21st, from this station to Grenada, a distance of 87 miles, the Jackson R. R. has been abandoned. Ten to fifteen miles of the road was submerged to a depth of from two to four feet. Rain has fallen almost incessantly in this portion of the State for the past two weeks; Big Black river is remarkably high, and much damage has resulted from its overflow. Goodman, 19th, lower portion of city inundated, the turnpike road destroyed, and the bridge over the Big Black river washed away. *Pennsylvania*: Bradford, 27th, heavy rains and ice gorges in the creeks caused serious flooding in the northern and eastern sections of the city. Many buildings surrounded by water, effecting considerable loss of property. *Tennessee*: Nashville, 10th, from the continued and heavy rains of the past few days low lands flooded in northern part of city to a considerable extent; river rising rapidly and filled with heavy drift-wood. 11th, river rising slowly; large quantity of logs carried away by the high water; heavy drift-wood in river; 9 p. m., river 41 feet and 8 inches above low water mark, or 4 inches below the danger-line. 12th, with continued rains river rose rapidly, reaching 42 feet and 2 inches above low water mark, or 10 inches above the danger-line. All the lower portions of the city and contiguous bottoms flooded. About 200 families forced to abandon their homes. An immense quantity of lumber and saw-logs have been swept down the river, and over 3,000 walnut logs lost in one of the tributaries of the upper Cumberland. 13th, river rising rapidly, being 46 feet and 9 inches above low water mark, or 5 feet and 5 inches above the danger-line; heavy drift-wood in river. The first story of houses in the flooded portion of the city, completely under water; people obliged to make use of improvised rafts in order to leave their dwellings. 14th, river 47 feet and 8 inches above low water mark or 6 feet and 4 inches above the danger-line; large amount of drift-wood in river. All mills on the Edgefield side of the city surrounded by water and their operations suspended. The Bucket Factory, Brick Yards, Southern Pump Factory and Indiana Mills inclosed by water and all operations suspended. Large number of houses flooded and deserted. 15th, river 48 feet and 6 inches above low water mark or 7 feet and 2 inches above the danger-line. Great suffering among the people who were compelled to vacate their homes. Each additional rise of but one inch drove many people from their houses; over 300 families now homeless. 16th, river 48 feet and 10 inches above low water mark, or 7 feet and 6 inches above the danger-line, and 5 feet 1 inch below the high water mark of 1847. Many additional houses submerged and families left homeless. 17th, 6 a. m., river 49 feet and 11 inches above low water mark, or 8 feet and 7 inches above the danger-line; 9 p. m., 50 feet and 11 inches, or 9 feet and 7 inches above the danger-line and 4 feet and 8 inches below the high water mark of 1847. All communication cut off from the pikes leading into the city; great suffering in the flooded district. 18th, 6 a. m., river 51 feet and 2 inches above low water mark, or 9 feet and 10 inches above the danger-line and 4 feet and 5 inches below the high water mark of 1847; 2.21 p. m., river stationary. During the afternoon and evening another heavy rain occurred when the river began to rise again. 19th, river 51 feet and 7 inches and still rising; 1.21 p. m., 51

feet and 11 inches; 9 p. m., 52 feet and 4 inches; over 500 families now homeless and the consequent suffering extreme; 10 p. m., river 53 feet and 4 inches above low water mark, or 12 feet above the danger-line and 2 feet and 3 inches below the high water mark of 1847. Although the river did not reach the highest point on the gauge as recorded in 1847, the volume of water was considerably greater. 20th, 6 a. m., river 52 feet and 5 inches, or a fall of 11 inches in the past 8 hours. All communication on streets leading out to North Nashville completely cut off; 9 p. m., communication with East Nashville entirely cut off and all railroad travel suspended except on the Louisville and Nashville Railroad and the Chattanooga and St. Louis Railroad. All other railroads in southern part of State submerged and unserviceable; midnight, river again rising rapidly, heavy rains still continue at intervals. 21st, 6 a. m., 52 feet and 11 inches; 1.21 p. m., 53 feet and 11 inches; 9 p. m., 53 feet and 9 inches. Many valuable rafts of pine and walnut were swept from the various lumber yards in the city. More than one-fifth of the population of the city have been compelled to move from their homes and places of business. Over 500 houses now under water. 22d, river 54 feet and 7 inches above low water mark or 13 feet and 3 inches above the danger-line and 1 inch above the great rise of 1847. Communication with north Nashville now entirely cut off and water 3 feet deep on North College street. 23d, 6 a. m., 54 feet and 2 inches; 9 p. m., 53 feet and 6 inches; river fell slowly throughout the day. Many small houses floated down the river during the past two days. 24th, 1.21 p. m., river 52 feet and 11 inches and slowly falling. 25th, 1.21 p. m., river 53 feet and 9 inches. 27th, 1.21 p. m., river 50 feet and 4 inches. 28th, 1.21 p. m., river 49 feet and 11 inches. 29th, 1.21 p. m., river 50 feet and 1 inch. 30th, 1.21 p. m., river 49 feet and 4 inches. 31st, river falling rapidly. The estimated loss of property in and about the city of Nashville, resulting from the overflow of the Cumberland, is placed at fully \$400,000. Many farms in the surrounding country were entirely flooded and the spring wheat crop will prove a complete failure. The entire river from its mouth to the head of navigation was above banks and continued above the danger-line for 19 days. For many miles around the entire country was flooded and all railroad and other travel suspended. The following is a comparative record of the highest water at Nashville for a period of several years: 1826, April, over 50 feet (?); 1847, March 18th, 54 feet, 6 inches; 1862, January, 50 feet, 3 inches; 1867, March, 51 feet, 1 inch; 1872, April 15th, 46 feet, 3 inches; 1873, February 21st and 22d, 39 feet; 1874, April 16th and 17th, 49 feet, 2 inches; 1875, March, 2d, 41 feet, 4 inches; 1876, January 29th, 4 feet, 6 inches; 1877, January 22d, 40 feet, 4 inches; 1878, April 26th, 27 feet, 3 inches; 1879, January 19th, 41 feet, 4 inches; 1880, March 17th, 46 feet, 5 inches; 1881, January 24th and 25th, 33 feet; 1882, January 22d, 54 feet, 7 inches. Johnsonville, 21st, river nine miles wide and rising rapidly; low lands flooded. 25th, water reached the iron rails of the R. R. bridge; houses, logs, lumber and debris of all kinds floating down the river in large quantities. The population numbering about 700 were driven from their homes, and the entire settlement was submerged. Camden, 21st, low lands submerged to a depth of about 5 feet; water rose 26 inches in past 24 hours. Pulaski, 20th, Richland river and other streams overflowed. Great damage throughout the country; much farm property destroyed and several villages inundated. Danville, 20th, Tennessee river overflowed, carrying away the bridge of the Louisville and Memphis R. R. Burnside, 21st, river 35 feet above low-water mark, and rising at the rate of 18 inches per hour. Clarksville, 20th, river overflowed; all houses on Front street flooded, some to a depth of three feet. Water Works surrounded, the boilers submerged, and all operations ceased. Much inconvenience and considerable loss has been experienced by mills and factories. On each side of Tennessee river, for a distance of several miles, water covered railroad tracks to a depth of three feet. In many warehouses water from two to five feet deep. River within 20

inches of the great flood of 1847. Cumberland City, 20th, railroad track 20 inches under water; all trains between this point and Paris, 65 miles distant, abandoned. Memphis, 15th, occasional drift in river. 16th, river overflowed opposite the city. 21st to 25th, heavy drift in river. 25th, river rising rapidly and now 34 feet 2 inches above low-water mark. 26th, river 34 feet and 4 inches above low-water mark and 4 inches above the danger-line. Track of the Memphis and Little Rock R. R. partly submerged. 27th, river 34 feet and 7 inches above low-water mark and 7 inches above the danger-line, with occasional drift. Wolfe river rising rapidly and moving with a "powerful current." 28th, river 34 feet and 9 inches above low-water mark and 9 inches above the danger-line; much drift in river. 29th, intervening country between station and Marion, Crittenden, Co., Arkansas, almost entirely submerged. At the latter place water five inches higher than ever before recorded; water running through the streets; many houses flooded and others surrounded. 31st river 34 feet and 11 inches above low-water mark and 11 inches above the danger-line. Memphis and Little Rock R. R. entirely submerged; passengers and baggage transported by aid of boats. Columbia, 21st, river has been subject to a series of heavy rises since the opening of the year. Much damage sustained by farmers along the line of the river, from the flooding of fields and the washing away of fences and other property. Knoxville, 17th, river higher than for many years past. Heavy land-slides occurred on the East Tennessee, Virginia and Georgia R. R. 28th, water in First creek higher than ever before known. In the flats east of the city many dwellings flooded and a large amount of property surrounded by water. Chattanooga, 18th, river above the danger-line and lower portions of the city submerged. 19th, river rising. 29th, river falling.

**High Tides.**—Delaware Breakwater, 18th, 19th, Indianola, 22th, 26th.

**Low Tides.**—New Haven, 22d, very low; Newport, 23d, unusually low, water about 3 feet below mean low tide. Between Camden and Philadelphia, 23d, high winds caused lowest water on the Delaware ever known before; several ferry boats ran aground on the bar, and other boats on the lower end of Windmill Island. New York, 24th, heavy northwest gale caused extremely low tide.

**Water Spouts.**—Warren Co., Tenn., 27th, p. m., near the head waters of Caney creek, one of the main tributaries of the Cumberland river.

#### TEMPERATURE OF WATER.

The temperature of water, as observed in rivers and harbors at Signal Service stations, with the average depth at which observations were taken, is given in the table on the left hand side of chart of No. III. Owing to the presence of ice or the breakage of instruments observations are wanting as follows: Alpena, 1st to 31st; Burlington, Vt., 23d to 31st; Escanaba, 2d to 31st; Buffalo, 4th to 7th, 22d to 26th, 29th to 31st; Cleveland, 22d to 24th, 27th to 31st; Duluth, 4th to 7th, 10th, 17th, 20th, 22d to 31st; Detroit, 2d to 31st; Chicago, 3d to 7th, 15th to 26th, 30th, 31st; Grand Haven, 4th to 9th, 14th to 31st; Marquette, 3d to 7th, 17th to 25th; Milwaukee, 4th to 31st; Sandusky, 1st to 11th, 14th to 31st; Toledo, 1st to 31st.

#### ATMOSPHERIC ELECTRICITY.

**Auroras.**—The most remarkable display of the month because of the continuity of the line of observation and the numerous points at which the phenomenon was noted, was that of the 19th, the following stations reporting: Charlottetown, P. E. I., during the evening. Halifax, N. S., p. m. St. John's, N. B., during the evening. Fredericton, N. B., 9 p. m. Eastport, 8 p. m. to midnight; arch formed at 8.30 p. m.; 10 p. m., very brilliant, of a red, greenish tinge, dark segment below; had a wavy lateral motion from east to west. Portland, 7.30 p. m., arch extending over the entire northeastern portion of the heavens; was of a deep straw color. Mt. Wash-

ington, 7 p. m. to morning of the 20th; faint yellowish light extending from NW. to ENE. Burlington, Vt., 7 to 11.45 p. m., diffuse white light in the form of an arch; dark segment below, but not well defined. Thatcher's Island, 8 p. m. to midnight; bright streak of bluish white light in northern heavens; altitude 25° and azimuth 90°. New London, 7 to 9.30 p. m., arch well defined; altitude 20° and azimuth 15° E. to 10° W. New Shoreham, 9.15 p. m., faint arch of light; altitude 20°. Newport, 7.20 to 11.33 p. m., unusually brilliant; arch well defined from 8 to 8.50 p. m.; altitude 12° to 15° and azimuth 90°; centre of arch, bright white, with upper and lower edges tinged with red; arch reappeared at 9.30 p. m.; numerous beams rose out of the dark segment and were very bright at points where they intersected the arch. Bangor, Me., 7 p. m. to morning of 20th; during the early morning the display became very brilliant; a dense band of "leadened hued clouds" darkened the northern horizon; from behind the cloud bank, broad bands of the softest light streamed toward the zenith and encircled the northern sky in a gorgeous halo; disappeared only at the approach of day. New Haven, 9 p. m., very brilliant. Point Judith, R. I., 7 p. m. to morning of 20th, very brilliant. Springfield, Mass., 7 p. m., to morning of 20th, extended along the northern horizon in a direction from NNW. to ENE., altitude about 15°; dark segment below arch and well defined, being a prominent feature of the display; 9.45 p. m., several streamers shot upward near the eastern end of the arch, and later at other portions, with at times a wavy lateral motion; light constantly changing in brightness and extent of surface; at times there were two irregular parallel bands of light extending horizontally above the dark segment, separated from each other by a dark band about the density of the dark segment below the arch; after 10 p. m. the light began to fade, and the dark segment decreased rapidly in size. Agawam, Mass., 7.30 to 10 p. m., probably covered about half the northern horizon; breadth of band about 20°; no streamers. Cornish, Me., from dark to morning of 20th. Gardiner, Me., 6 p. m. to morning of 20th. Dexter, Me., visible most of night; very brilliant. Contoocookville, N. H., 9 to 10 p. m., bright arch, with dark segment below. Newport, Vt., 7 to 10 p. m. Woodstock, Vt., 8 to 9 p. m., extended across northern sky; altitude about 30°. Cambridge, Mass., 6 p. m., over dark sky; rather bright all the evening. Westborough, Mass., very brilliant. Williamstown, Mass., 7.30 p. m., bright arch, with small faint streamers above and dark segment below. Fall River, Mass., broad band in northwestern sky, extending half way to the zenith; numerous streamers. Boston, 7 p. m., till after midnight, very brilliant. South Lee, Mass., 8 p. m., bright arch, with numerous streamers. Southington, Conn., 9 p. m., bright arch, with streamers. Madison Barracks, N. Y., 7 p. m. Ardenia, N. Y., 9 to 11 p. m., very brilliant. Brookhaven, N. Y., 8 to 10.30 p. m., very brilliant. Ithaca, N. Y., 8 to 11 p. m., bright arch, sharply defined with dark segment below; 10 p. m., two arches formed, were sharply defined, but quite irregular; at times the light seemed to concentrate in masses, resting on the dark segment, and again streamers shot upward to a height of 30°, with a lateral motion from west to east. North Volney, N. Y., 10.15 p. m. Palermo, N. Y., 9 p. m. Rochester, 8 to 11.15 p. m., horizontal bands of light, no dark segment below. Oswego, 7.30 p. m., to 2.30 a. m. of 20th, bright arch of light with streamers occasionally shooting to zenith; display constantly changing color from a reddish to a pale yellow. Atco, N. J., low bright arch, dark segment below, but no streamers. Somerville, N. J., 9 to 10.30 p. m., bright arch with streamers. Freehold, N. J., 7.30 to 9 p. m. Moorestown, N. J., 9 p. m., low distinct arch, no streamers. Princeton, N. J., during evening. Dyberry, Pa., 8 p. m., bright arch. Great Falls, Md., 9.15 to 10.15 p. m., bright arch with streamers. Toronto, during evening. Port Huron, 6 to 11.30 p. m., diffuse light, altitude 30°. Bellefontaine, O., 9 p. m., bright arch, with dark segment below. North Lewisburg, O., 8 p. m., long low arch. Ruggles, O., 8 to 9 p. m., diffuse light. New Cory-



don, Ind., 8 to 10 p. m., bright arch. Lansing, Mich., during evening. Riley, Ill., 7.20 to 10.30 p. m., bright arch, altitude 14°. Elmira, Ill., 9 p. m., faint bluish light, with streamers. Morrison, Ill., during evening. Dubuque, 7.10 to 10.30 p. m., very brilliant, altitude 30°; extended from N. 20° W. to N. 30° E. Beloit, Wis., during evening. Franklin, Wis., during evening. LaCrosse, 8.30 p. m. to 4 a. m. of 20th. St. Paul, 9 to 11.30 p. m., bright arch of pale yellow, altitude from 10° to 15°, no streamers. Northfield, Minn., 6 p. m. to 6 a. m. of 20th, Guttenburg, Ia., 7 to 10 p. m. Clinton, Ia., during evening, bright arch, altitude 20°, no streamers. Cresco, Ia., 7 to 10.30 p. m., diffuse light extending from NNW. to ENE. Monticello, Ia., during evening. Des Moines, 7 p. m., bright arch with dark segment below. Moorhead, Minn., 8 to 11 p. m., bright arch of pale yellow. Bismarck, 6 p. m. to morning of 20th, Rapid City, Dak., 7 to 10.30 p. m. Ft. Meade, Dak., during evening. The next most important display was that of the 14th, the line of observation extending eastward from Cape Breton Island to Dakota, the following stations reporting: Charlotte-town, P.E.I., during evening. Fredericton, N.B., during evening. Eastport, 11.30 p. m., to midnight; diffuse light. Newport, R.I., 10.15 p. m., to morning of 20th, diffuse light; a few streamers rose to an altitude of 15° or 20°, but lasted only a few moments. Burlington, Vt., 11 to 11.45 p. m., bright arch with streamers reaching an altitude of 25°; no dark segment. Cambridge, Mass., 7.30 to 10.30 p. m. Southington, Conn., 9 p. m., faint light low down upon the horizon. Waterburg, N. Y., 9.30 p. m. Rochester, 10 to 11 p. m., faint light. Toronto, during evening. Lansing, Mich., during evening. Clear Creek, Neb., 9 p. m., faint light. St. Vincent, 7 to 11 p. m., very brilliant, with two arches; light frequently reached the zenith; forks of light characteristic of merry dancers extended along both arches; they increased in brilliancy on the western quarter of the arches and gradually faded away as they approached the eastern quarter. The following, with the exception of the 11th, were local displays: Fredericton, N. B., 15th. St. John, N. B., 15th. Eastport, 15th, 8.30 to 9.10 p. m., bright arch with several streamers, some of which shot upward to a height of 30°. Contoocookville, N. H., 11th, diffuse light. Thatcher's Island, 15th, 7 to 7.10 p. m., faint light. Cambridge, Mass., 11th, aurora suspected at 9.30 p. m. and at 11 p. m., a broken arch with a few streamers became visible. Southington, Conn., 11th, 9 p. m., faint light. Atco, N. J., 24th, 8 p. m., two faint arches resembling a double rainbow; no dark segment. Gardiner, Me., 11th, 8.30 p. m. to 12.30 a. m. of the 12th; 30th, 4.30 a. m. Dexter, Me., 12th. Waterburg, N. Y., 11th. Catawissa, Pa., 22d. Toronto, 11th. Rochester, 11th, 9 to 11.30 p. m., diffuse light. New Corydon, Ind., 23d, 6 p. m. to 2.30 a. m. of the 24th, three well defined arches, altitude, 30°; 24th, from early evening to morning of 25th. Lansing, Mich., 11th, during evening. Northport, Mich., 11th, 9 p. m. Alpena, 11th, 8.30 p. m. to 12.40 a. m. of 12th, diffuse light with a few streamers occasionally reaching near zenith. Grand Haven, 11th, 10 p. m. to 1.30 a. m. of 12th, resembling morning dawn. Beloit, Wis., 11th, during evening. Franklin, Wis., 11th, during evening. Cresco, Iowa, 11th, 8.30 to 9.30 p. m., faint light. Northfield, Minn., 11th, 9.15 to 10.20 p. m., bright streamers occasionally reaching an altitude of 45°. Cedar Rapids, Iowa, 13th; Clear Creek, Neb., 1st, faint light. St. Vincent, 10th, 8 to 11 p. m., diffuse light with a slight lateral motion; 23d, 7 to 11 p. m., faint light. Phelps, N. Y., 21st, bright arch of bluish white, altitude about 23° with an azimuth of over 110°; this condition remained intact for about two hours, when the arch broke into a number of large beams, having a slow but uniform motion eastward; light sufficiently brilliant to cast distinct shadows upon the snow.

**Zodiacal Light.**—Nashville, 9th, 11th, 14th; St. Vincent, Minn., 9th; Springfield, Ill., 14th; Dayton, Wash. Ty., 17th, 18th, 20th; Rio Vista, Cal., 16th to 20th; New Corydon, Ind., 9th, 14th, 17th, 19th; Clinton, Ia., 9th, 11th, 13th, 14th, 16th, 17th; Cresco, Ia., 8th, 11th, 14th, 16th, 18th, 19th, 21st, 22d; Monticello, Ia., 9th, 10th, 13th, 14th, 16th, 17th, 18th, 21st;

Yates Centre, Kan., 15th, 17th, 18th, 21st, 22d; Cambridge, Mass., 7th, 9th, 11th, 12th, 14th, 15th, 17th, 19th, 22d, 27th; Rowe, Mass., 19th; Clear Creek, Nebr., 8th, 10th, 11th, 13th, 14th, 16th to 21st; Bellefontaine, O., 14th; Stateburg, S. C., 15th, 16th; Wytheville, Va., 14th; Franklin, Wis., 11th, 12th, 13th.

**Thunder-storms.**—They were reported in the various districts as follows: Middle Atlantic States, Fallston, Md., 16th; South Atlantic States, 1st, 21st, 28th; East Gulf States, 8th, 10th, 13th, 27th, 28th; West Gulf States, 13th, 27th; Tennessee, Ashwood, 12th; Ohio Valley, 2d, 6th, 7th; Upper Lake Region, 8th, 26th; Upper Mississippi Valley, 2d, 6th, 7th, 8th, 26th; Lower Missouri Valley, 6th, 7th, 8th, 10th, 12th, 13th; Southern Slope, Jacksboro, Tex., 16th, 27th; Pacific Coast, San Diego, 12th, Red Bluff, 23d; San Francisco, 24th.

**Atmospheric Electricity Interfering with Telegraphic Communication.**—Bismarck, Dak., 19th, "sufficiently strong so that telegraph operator was able to work an open wire without the aid of battery. The current was so violent that it scorched the rubber covering of the wires and filled the room with the stench of burning compound. In placing the ends of the positive and negative wires together, a bright light about the size of a large shirt button was created, which rapidly revolved between the butts, illuminated the office."

#### OPTICAL PHENOMENA.

**Solar halos** have been observed in the various districts on the following dates: New England, 1st, 5th, 10th, 12th, 16th, 18th, 20th, 21st, 28th, 31st; Middle Atlantic States, 1st, 4th, 10th, 12th, 15th, 16th, 19th, 27th, 30th; South Atlantic States, Hatteras, 21st; East Gulf States, Pensacola, 19th, 23d; West Gulf States, Little Rock, 14th; Rio Grande Valley, Eagle Pass, 3d; Ohio Valley and Tennessee, 1st, 9th, 11th, 14th, 15th, 17th, 19th, 23d, 24th, 27th, 29th, 30th and 31st; Lower Lake Region, 12th, 15th, 18th, 25th; Upper Lake Region, 3d, 4th, 5th, 12th, 14th, 16th, 18th, 19th, 23d, 24th, 27th, 28th; Extreme Northwest, Moorhead, Minn., 20th; Upper Mississippi Valley, 1st to 6th, 9th, 11th, 12th, 13th, 14th, 15th, 16th, 17th, 18th, 19th, 23d, 26th, 27th, 28th, 29th, 30th; Missouri Valley, 2d, 11th, 12th, 13th, 14th, 17th, 19th, 27th to 30th; Northern Slope, Rapid City, Dak., 3d; Deadwood, 27th, and North Platte, 29th; Middle Slope, 19th, 23d, 25th, 28th, 29th; Southern Plateau, Florence, Ariz., 4th, 7th; Middle Plateau, Pioche, 18th; Salt Lake City, 18th, 22d; Pacific Coast Regions, San Francisco, 3d, 9th, 11th, 15th, 22d, 28th; Poway, Cal., 27th; Sacramento, 22d, San Diego, 7th, 27th; Eola, Or., 29th.

**Lunar halos** have been observed in the various districts on the following dates: New England, 1st, 3d, 4th, 7th, 18th, 22d, 24th, 25th, 27th, 31st; Middle Atlantic States, 2d to 5th, 10th, 12th, 14th, 15th, 22d, 23d, 24th, 26th to 31st; South Atlantic States, 1st, 4th, 5th, 6th, 23d, 24th, 25th, 27th, 28th, 29th; Florida Peninsula, Key West, 24th; East Gulf States, 3d to 6th, 23d, 26th, 27th, 28th; West Gulf States, 1st to 4th, 6th, 9th, 25th to 28th, 31st; Rio Grande Valley, 2d, 3d, 4th; Ohio Valley and Tennessee, 1st, 3d, 6th, 12th, 23d, 24th, 26th, 27th, 28th, 29th, 30th, 31st; Lower Lake Region, 4th, 5th, 7th, 10th, 12th, 24th, 27th, 28th, 29th, 31st; Upper Lake Region, 1st to 5th, 8th, 9th, 10th, 14th, 15th, 19th, 23d, 27th, 29th, 30th, 31st; Extreme Northwest, 2d, 3d, 10th, 30th; Upper Mississippi Valley, 2d, 3d, 6th, 8th, 9th, 12th, 13th, 23d, 26th to 31st; Missouri Valley, 1st, 2d, 3d, 10th, 12th, 22d, 23d, 25th to 29th, 31st; Northern Slope, 1st, 4th, 11th, 13th, 22d, 23d, 25th, 26th, 29th, 31st; Middle Slope, 1st to 7th, 10th, 24th, 25th, 27th, 28th, 29th; Southern Plateau, 2d, to 6th, 27th to 31st; Middle Plateau, 1st, 3d, 4th, 5th, 24th, 26th, 29th, 30th; Northern Plateau, 24th, 29th, 30th, 31st; North Pacific Coast, 11th, 29th, 31st; Middle Pacific Coast, 5th, 11th, 22d, 27th, 30th; South Pacific Coast, Yuma, 2d, 5th, 13th, 28th; Poway, Cal., 27th. Exceptionally brilliant displays were observed at Pioche, Nev., on the 3d, from 7 p. m. to midnight, and at Council Bluffs, Ia., on the 31st, from about 8 to 11 p. m. The parhelic circle with the accompanying paraselenae were present in both instances.





where it continued for the remainder of the passage, occasionally getting to WSW. and back again."

The following statement shows the summarized precipitation for the 12 months ending June 30th, 1881, at the various stations of the Central Pacific Railroad, furnished through the courtesy of its chief engineer, Mr. S. S. Montague: San Francisco, 29.89 inches; Oakland, 20.79; Niles, 20; Pleasanton, 19.57; Livermore, 16.45; Tracy, 10.68; Lathrop, 13.34; Stockton, 15.31; Galt, 15.93; Brighton, 13.63; Sacramento, 22.14; Rocklin, 21.32; Auburn, 37.42; Colfax, 48.14; Alta, 50.97; Emigrant Gap, 62.26; Cisco, 82.71; Summit, 66.39; Truckee, 21.97; Boca, 15.80; Reno, 5.74; Wadsworth, 4.23; Hot Springs, 2.95; Brown's, 3.38; Humboldt, 5.52; Winnemucca, 10.18; Golconda, 4.92; Battle Mountain, 6.07; Beowawe, 6.26; Palisade, 10.61; Carlin, 10.35; Elko, 5.35; Halleck, 4.64; Wells, 3.97; Otego, 5.35; Toano, 2.34; Tecoma, 2.62; Terrace, 4.24; Kelton, 5.03; Promontory, 2.93; Blue Creek, 12.01; Corinne, 14.57; Ogden, 11.55; Marysville, 17.43; Chico, 17.62; Tehama, 10.40; Red Bluff, 28.95; Redding, 50.77; Modesto, 8.40; Turlock, 9.05; Merced, 11.59; Borden, 10.68; Fresno, 8.22; Kingsburg, 9.49; Martinez, 19.66; Dunnigan, 19.65; Williams, 15; Willows, 13.67; Antioch, 17.39; Brentwood, 12.49; Byron, 16.05; South Vallejo, 21.98; Napa, 28.19; Calistoga, 40.48; Suisun, 24.52; Davis, 18.55; Woodland, 18.54; Knight's Landing, 17.96; San Mateo, 21.09; Menlo Park, 18.36; San Jose, 12.46; Tenant's, 24.81; Gilroy, 23.42; Hollister, 12.48; Pajaro, 19.91; Salinas, 12.48; Soledad, 6.78; Monterey, 13.91; Santa Cruz, 29.64; Lemoore, 8.59; Visalia, 10.65; Goshen, 9.69; Tulare, 9.98; Delano, 6.75; Sumner, 3.59; Caliente, 9.80; Keene, 11.12; Tehachapi, 8.16; Mohave, 1.27; Ravenna, 5.40; Newhall, 9.15; San Fernando, 9.45; Los Angeles, 10; Spadra, 10.22; Colton, 6.08; Whitewater, 4.69; Indio, 1.20; Mammoth Tank, 1.82;

Yuma, 1.29; Texas Hill, 1.52; Maricopa, 0.88; Pantano, 1.25; Ione, 17.26; Farmington, 13.20; Anaheim, 7.08; Petaluma, 23.29.

*Meteors.*—Des Moines, Ia., 18th; Davenport, Ia., 22d; Helena, Mont., 15th; North Platte, Neb., 16th, 6.20 p. m., meteor of unusual size shot from a point near the zenith towards the western horizon, and bursted at an altitude of about 30°, casting a beautiful cluster of incandescent points of light in every direction. Yuma, Ariz., 5th, 9th, 17th; Rio Vista, Cal., 20th; Monticello, Ia., 17th, 22d; Dexter, Me., 7th; Woodstock, Md., 11th, 14th, 24th; Clear Creek, Neb., 8th, 10th, 11th, 13th, 14th, 16th to 19th, 21st; Atco, N. J., 9th, 14th, 22d; Stateburg, S. C., 14th; Flemington, W. Va., 30th.

*Migration of Birds.*—*Geese flying northward:* Augusta, 14th; Shreveport, 12th; De Soto, Nebr., 5th. *Flying southward:* Laconia, Ind., 21st; Cairo, Ill., 28th, 29th; Portland, Or., 20th; Sacramento, Cal., 5th, 6th, 8th. *Indanola, 6th, 10th. Ducks flying northward:* Charleston, Ill., 2d, 26th; Shreveport, 30th, Yates Centre, Kan., 9th. *Flying southward:* Port Huron, 5th.

*Polar Bands.*—Baltimore, Md., 27th; Pensacola, Fla., 27th; Nashville, 2d; Florence, Ariz., 23d, 26th; Prescott, Ariz., 13th; New Corydon, Ind., 3d, 9th, 17th, 18th, 24th, 27th, 30th; Auburn, N. H., 30th; Freehold, N. J., 9th, 29th; Vineland, N. J., 13th, 15th; Waterburg, N. Y., 19th; Woodstock, Vt., 25th; Wytheville, Va., 3d, 11th, 22d, 23d, 24th.

*Earthquakes.*—Cape Lookout, N. C., 8th, 5.10 p. m., shock of about 10 seconds duration; house forcibly shaken, jarring windows and doors. Centerville, Cal., 26th, two severe shocks.

*Prairie and Forest Fires.*—Yankton, Dak., 6th to 9th, 23d, 24th; Ft. Gibson, Ind. Ty., 5th, 7th, 24th.

*Sand Storms.*—Ft. Verde, 11th; Yuma, 7th, 11th.

PUBLISHED BY ORDER OF THE SECRETARY OF WAR:

W. B. HAZEN,

Brig. & Bvt. Maj. Gen'l,

Chief Signal Officer, U. S. A.

Copy furnished for

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*A general abstract of meteorological observations made at Philadelphia, Pa., for 30½ years from July 1st, 1851, to*

Monthly averages for 30½ years.	THERMOMETER.																	Maximum.						
	Maximum.			Minimum.			Warmest day.			Coldest day.			Mean daily range.	Mean daily oscillation.	Means.									
	Degree.	Day.	Year.	Degree.	Day.	Year.	Mean.	Day.	Year.	Mean.	Day.	Year.			Mean.	Day.	Year.	7 a. m.	2 p. m.	9 p. m.	Monthly.	Height.	Day.	Year.
January.....	69	2	1876	- 9	8	1866	60.67	4	1874	- 1.00	9	1856	6.58	12.32	29.38	36.38	32.59	32.78	30.757	8	1866			
February.....	74	23	1874	- 1	7	1855	61.67	13	1880	+ 5.70	7	1855	6.96	13.71	30.30	39.02	34.56	34.63	30.970	11	1867			
March.....	75½	3	1861	+ 4	10	1856	66.00	3	1861	10.83	3	1868	6.24	14.53	36.41	46.32	40.80	41.13	30.666	6	1873			
April.....	88	24	1861	20	7	1857	74.30	29	1856	27.70	2	1857	6.03	16.26	45.79	58.04	50.69	51.84	30.565	13	1874			
May.....	96½	26	1880	35	7	1854	87.83	26	1880	40.00	3	1861	5.34	16.37	58.96	70.20	62.32	63.83	30.445	12	1874			
June.....	98	29	1856	42	5	1859	90.50	5	1856	53.50	9	1867	4.55	15.23	69.62	79.59	72.39	78.86	30.309	11	1867			
July.....	102	29	1874	53	3	1857	93.33	9	1876	59.70	3	1857	3.62	14.23	74.78	84.18	77.59	78.85	30.303	31	1869			
August.....	98	21	1869	47	24	1856	89.67	21	1869	59.00	26	1856	3.40	13.85	72.12	81.61	75.30	76.34	30.382	17	1880			
September.....	102	13	1881	39	25	1856	90.67	7	1881	48.30	30	1860	4.43	14.34	64.23	74.90	68.10	69.10	30.466	24	1867			
October.....	90	4	1854	23	25	1856	82.33	1	1881	35.50	27	1859	5.46	14.66	62.54	63.33	56.45	57.43	30.748	26	1879			
November.....	80	1	1869	15	30	1875	72.30	9	1867	18.00	30	1875	5.73	12.90	42.16	50.32	45.42	45.97	30.697	6	1880			
December....	71	2	1859	0	30	1860	62.80	2	1859	4.00	30	1880	6.36	12.13	32.81	39.33	35.62	35.92	30.727	31	1874			
Seasons.		m. d.			m. d.			m. d.			m. d.									m. d.				
Winter.....	74	2 23	1874	- 9	1 8	1866	62.80	12 2	1859	- 1.00	1 9	1856	6.63	12.72	30.76	38.15	34.16	34.34	30.970	2 11	1867			
Spring.....	96½	5 26	1880	+ 4	3 10	1856	87.83	5 26	1880	+ 10.83	3 3	1868	5.87	15.72	47.39	58.18	51.27	52.28	30.666	3 6	1873			
Summer.....	102	7 9	1876	42	6 5	1869	93.33	7 9	1876	53.50	6 9	1867	3.89	14.45	72.20	81.84	75.11	76.38	30.382	6 17	1880			
Autumn.....	102	9 7	1881	13	11 30	1875	90.67	9 7	1881	18.00	11 30	1875	5.20	13.94	53.00	62.84	56.64	57.49	30.697	11 6	1880			
Means for 30½ years.	102	7 9	1876	- 9	1 8	1866	93.33	7 9	1876	- 1.00	1 9	1856	5.40	14.23	60.88	60.30	54.34	55.17	30.970	2 11	1867			



t, 1851, to December 31st, 1881, by James A. Kirkpatrick, A. M. Latitude 39° 57½' N., longitude 75° 11¼' W. from Greenwich.

BAROMETER REDUCED TO 32° FAHRENHEIT.														RELATIVE HUMIDITY.					FORCE OF VAPOUR.							
Maximum.		Minimum.		Mean daily pressure.								Means.				Maximum.	Minimum.	Means.				Maximum.	Minimum.	Means.		
Day.	Year.	Height.	Day.	Year.	Greatest.			Least.			Mean daily range.	7 a. m.	2 p. m.	9 p. m.	Monthly			7 a. m.	2 p. m.	9 p. m.	Monthly			7 a. m.	2 p. m.	9 p. m.
					Inch.	Day.	Year.	Inch.	Day.	Year.																
8	1866	28.911	23	1853	30.065	8	1860	29.078	8	1852	0.230	30.013	29.974	30.002	29.996	100	17	76.1	62.9	72.7	70.6	.528	.020	.135	.145	.144
11	1867	28.954	4	1869	30.862	11	1867	29.227	16	1856	0.238	29.980	29.936	29.964	29.990	100	13	74.4	59.1	71.2	68.2	.549	.012	.136	.150	.154
6	1873	29.003	30	1881	30.025	6	1873	29.093	30	1881	0.215	29.911	29.860	29.890	29.887	100	11	70.6	51.9	65.9	62.8	.574	.023	.162	.171	.174
13	1874	28.920	23	1866	30.495	13	1874	28.959	21	1852	0.170	29.879	29.831	29.857	29.855	100	7	66.6	47.4	63.5	59.2	.689	.031	.225	.234	.244
12	1874	28.778	8	1867	30.396	9	1873	29.013	8	1867	0.128	29.871	29.829	29.850	29.850	100	11	68.2	48.4	65.5	60.7	.829	.066	.351	.359	.377
11	1867	29.182	11	1857	30.295	25	1873	29.262	11	1857	0.106	29.876	29.840	29.858	29.856	100	18	70.8	51.8	68.4	63.7	1.059	.142	.621	.625	.653
31	1869	29.443	19	1851	30.209	31	1860	29.512	21	1857	0.096	29.883	29.853	29.865	29.867	97	26	70.9	51.7	68.1	63.6	.904	.255	.618	.606	.644
17	1860	29.356	20	1856	30.322	1	1869	29.388	30	1856	0.095	29.917	29.885	29.901	29.901	100	22	74.2	54.8	70.5	66.5	1.024	.188	.693	.690	.692
24	1867	29.281	18	1863	30.392	24	1867	29.403	18	1856	0.122	30.002	29.958	29.982	29.981	100	22	75.9	55.0	72.1	67.6	.991	.125	.478	.489	.511
26	1879	29.012	26	1857	30.651	25	1879	29.059	26	1857	0.160	29.978	29.931	29.958	29.956	100	15	74.7	53.5	70.5	66.2	.742	.060	.315	.329	.333
6	1860	28.822	18	1873	30.616	22	1860	29.032	22	1875	0.201	29.970	29.928	29.957	29.952	100	17	72.8	55.5	68.8	65.7	.832	.036	.314	.316	.322
31	1874	28.648	10	1878	30.682	31	1874	28.923	10	1878	0.226	30.000	29.965	29.989	29.985	100	11	74.3	61.5	71.9	69.2	.551	.023	.147	.159	.164
m. d.			m. d.			m. d.			m. d.																	
2 11	1867	28.648	12 10	1878	30.862	2 11	1867	28.923	12 10	1878	0.290	29.967	29.957	29.964	29.979	100	11	74.0	61.1	71.9	69.3	.551	.012	.139	.160	.164
3 6	1873	28.778	5 8	1867	30.625	3 6	1873	28.959	4 21	1882	0.171	29.887	29.839	29.868	29.864	100	7	68.5	49.2	65.0	60.9	.829	.025	.246	.255	.264
8 17	1860	29.162	6 11	1867	30.322	8 1	1869	29.127	8 1	1864	0.099	29.883	29.861	29.874	29.876	100	15	71.7	52.7	68.9	64.5	1.059	.142	.577	.573	.603
1 6	1860	28.822	11 18	1873	30.651	10 25	1879	29.032	11 22	1878	0.161	29.983	29.939	29.965	29.962	100	17	74.5	64.7	70.4	66.5	.991	.036	.336	.345	.364
2 11	1867	28.648	12 10	1878	30.862	2 11	1867	28.923	12 10	1878	0.165	29.939	29.890	29.922	29.920	100	7	72.5	64.4	69.0	65.3	1.039	.012	.325	.331	.344

umber 31st, 1881, by James A. Kirkpatrick, A. M. Latitude 39° 57½' N., longitude 75° 11¼' W. from Gre

BAROMETER REDUCED TO 32° FAHRENHEIT.														RELATIVE HUMIDITY.								FORCE OF WIND.		
Minimum.		Mean daily pressure.								Mean daily range.	Means.				Maximum.	Minimum.	Means.				Maximum.	Minimum.	7 a. m.	
Day.	Year.	Height.	Day.	Year.	Height.	Day.	Year.	Greatest.	Least.		7 a. m.	2 p. m.	9 p. m.	Monthly.			p. c.	p. c.	7 a. m.	2 p. m.				9 p. m.
		Inch.			Inch.					Inch.	Inch.	Inch.	Inch.			p. c.	p. c.	p. c.	p. c.	Inch.	Inch.	Inch.		
23	1863	30.665	8	1866	29.078	6	1852			0.230	30.013	29.974	30.002	29.996	100	17	76.1	62.9	72.7	70.6	.528	.020	.135	
4	1860	30.862	11	1867	29.227	16	1856			0.238	29.960	29.936	29.964	29.960	100	13	74.4	59.1	71.3	68.2	.549	.012	.136	
30	1881	30.625	6	1873	29.098	30	1881			0.215	29.911	29.860	29.890	29.887	100	11	70.6	51.9	65.9	62.8	.574	.023	.162	
23	1866	30.495	13	1874	28.969	21	1852			0.170	29.879	29.831	29.857	29.855	100	7	66.6	47.4	63.5	59.2	.680	.031	.225	
8	1867	30.396	9	1879	29.013	8	1867			0.128	29.871	29.829	29.850	29.850	100	11	65.2	48.4	65.5	60.7	.829	.060	.351	
11	1857	30.298	25	1873	29.262	11	1857			0.106	29.876	29.840	29.853	29.856	100	18	70.8	51.8	68.4	63.7	1.059	.142	.521	
19	1851	30.269	31	1869	29.512	21	1857			0.096	29.883	29.853	29.865	29.867	97	26	70.9	51.7	68.1	63.6	.994	.255	.618	
20	1856	30.322	1	1869	29.388	20	1856			0.095	29.917	29.885	29.901	29.901	100	22	74.2	54.8	70.5	66.5	1.024	.188	.593	
18	1863	30.392	24	1867	29.403	16	1856			0.122	30.002	29.958	29.982	29.981	100	22	75.9	55.0	72.1	67.6	.991	.125	.478	
26	1857	30.651	25	1879	29.059	26	1857			0.160	29.978	29.931	29.958	29.956	100	18	74.7	53.5	70.5	66.2	.742	.060	.315	
18	1873	30.616	22	1880	29.032	22	1878			0.201	29.970	29.928	29.957	29.952	100	17	72.8	55.5	68.8	65.7	.832	.036	.214	
10	1878	30.682	31	1874	28.923	10	1878			0.226	30.000	29.965	29.989	29.985	100	11	74.3	61.5	71.9	69.2	.551	.023	.147	
m. d.			m. d.			m. d.																		
12 10	1878	30.862	2 11	1867	28.923	12 10	1878			0.230	29.907	29.857	29.984	29.979	100	11	74.9	61.1	71.9	69.3	.551	.012	.139	
5 8	1867	30.625	3 6	1873	28.969	4 31	1852			0.171	29.887	29.839	29.866	29.864	100	7	68.5	49.2	65.0	60.9	.829	.023	.246	
6 11	1867	30.322	8 1	1869	29.137	8 1	1864			0.099	29.893	29.861	29.874	29.876	100	18	71.7	52.7	68.9	64.5	1.059	.142	.577	
11 18	1873	30.651	10 25	1879	29.032	11 22	1878			0.161	29.983	29.939	29.965	29.962	100	17	74.5	54.7	70.4	66.5	.991	.036	.336	
12 10	1878	30.862	2 11	1867	28.923	12 10	1878			0.165	29.939	29.899	29.922	29.920	100	7	72.5	54.4	69.0	65.3	1.059	.012	.325	



from Greenwich. Barometer cistern 55½ feet above mean tide in the Delaware river.

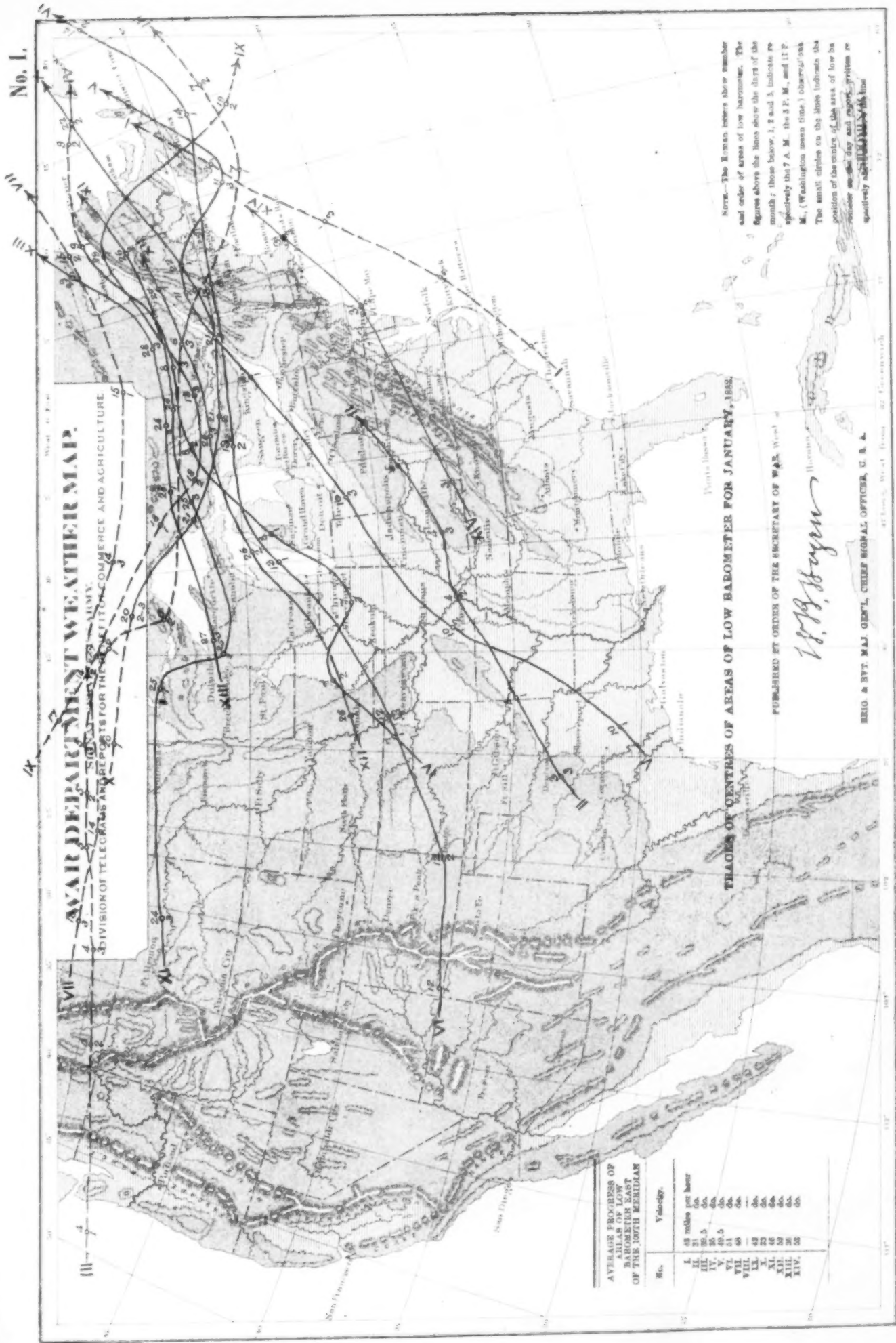
FORCE OF VAPOUR.					CLOUDS.								Rain or melt- ed snow.		WINDS.	
Minimum.	Means.				Clear days. Sky $\frac{1}{2}$ or less covered.	Cloudy days. More than $\frac{1}{2}$ covered.	Means of sky covered.				No. of days it fell.	Amount.	Resultant.	No. of times in 10.		
	7 a. m.	2 p. m.	9 p. m.	Monthly.			7 a. m.	2 p. m.	9 p. m.	Monthly.						
Inch.	Inch.	Inch.	Inch.	Inch.	Days.	Days.	Tenths.	Tenths.	Tenths.	Tenths.		Inches.	Direction from			
.020	.135	.145	.145	.142	8.6	22.4	6.29	6.19	5.09	5.86	10.6	3.331	N. 63° 56' W.	286		
.012	.136	.150	.155	.147	8.9	19.3	6.02	5.91	4.84	5.59	9.6	3.180	N. 66° 39' W.	264		
.023	.162	.171	.179	.170	9.3	21.7	6.09	6.28	4.92	5.76	12.0	3.800	N. 61° 28' W.	246		
.031	.225	.234	.246	.235	8.6	21.4	6.12	6.52	5.12	5.92	11.9	3.994	N. 65° 57' W.	165		
.066	.351	.350	.377	.362	9.4	21.6	5.81	6.30	4.72	5.61	11.3	4.100	N. 69° 25' W.	141		
.142	.621	.625	.653	.633	8.4	21.6	5.89	6.23	4.42	5.52	11.2	4.281	S. 69° 28' W.	204		
.255	.618	.606	.647	.624	7.0	23.1	5.73	6.21	4.23	5.39	10.9	4.122	S. 65° 49' W.	193		
.188	.593	.590	.621	.601	9.2	21.8	5.82	6.27	4.21	5.43	10.1	4.765	S. 72° 34' W.	144		
.125	.478	.489	.515	.494	10.4	19.6	6.07	5.53	3.96	5.19	8.3	3.822	S. 85° 09' W.	127		
.060	.315	.329	.333	.325	10.8	20.2	5.84	5.27	4.10	5.00	8.5	3.223	N. 78° 44' W.	227		
.036	.214	.216	.224	.218	8.2	20.8	5.88	5.97	4.94	5.59	10.1	3.614	N. 73° 34' W.	206		
.025	.147	.139	.158	.155	8.1	22.9	6.44	6.40	5.18	6.01	10.6	3.532	N. 67° 06' W.	268		
Quar ter.																
.012	.139	.150	.151	.147	25.8	64.5	6.26	6.15	5.03	5.81	30.7	10.036	N. 66° 55' W.	275		
.023	.246	.255	.267	.256	27.2	64.8	6.01	6.36	4.92	5.76	35.2	11.954	N. 66° 36' W.	178		
.142	.577	.573	.607	.586	25.9	66.1	5.85	6.26	4.29	5.47	32.3	13.205	S. 65° 24' W.	174		
.036	.336	.345	.367	.346	30.4	66.6	5.85	5.59	4.34	5.26	27.1	10.658	N. 75° 15' W.	206		
Ann ual.																
.012	.225	.231	.246	.234	100	256	5.99	6.11	4.65	5.56	125	45.939	N. 77° 22' W.	194		





# WAR DEPARTMENT WEATHER MAP.

DIVISION OF TELEGRAMS AND REPORTS FOR THE ARMY.



AVERAGE HOURS OF  
SUNSHINE AT  
BAROMETER EAST  
OF THE 100TH MERIDIAN

No.	Velocity
I.	00 miles per hour
II.	00.5
III.	00.5
IV.	00.5
V.	00.5
VI.	00.5
VII.	00.5
VIII.	00.5
IX.	00.5
X.	00.5
XI.	00.5
XII.	00.5
XIII.	00.5
XIV.	00.5

TRAJECTORIES OF CENTRES OF AREAS OF LOW BAROMETER FOR JANUARY, 1892.

PUBLISHED BY ORDER OF THE SECRETARY OF WAR, WASH.

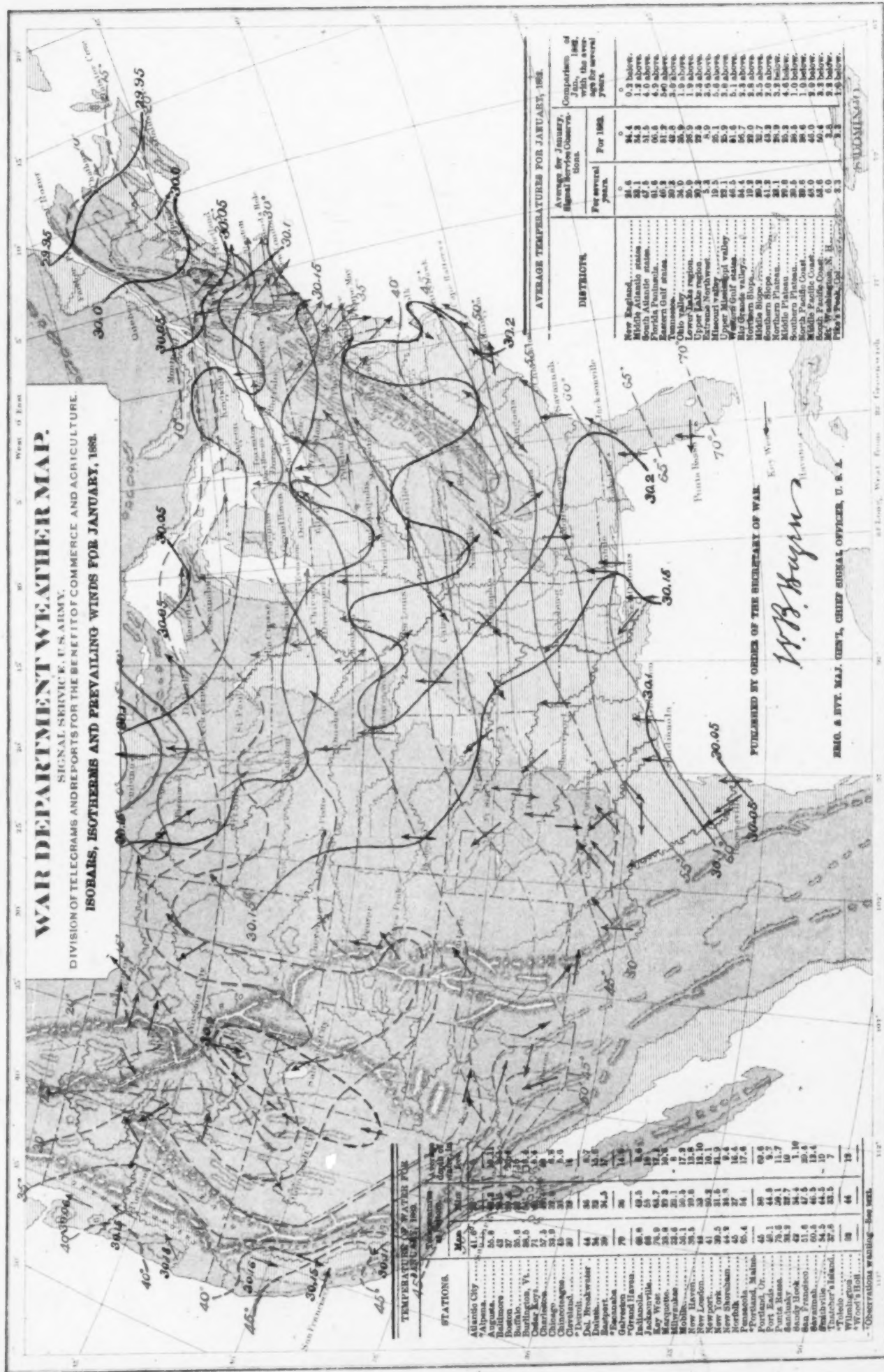
*W. H. H. H.*

BRIG. & SGT. MAJ. GEN'L. CHIEF SIGNAL OFFICER, U. S. A.

NOTE.—The Roman letters show number and order of areas of low barometer. The figures above the lines show the days of the month; those below, 1, 2 and 3 indicate respectively that 7 A. M., the 3 P. M., and 11 P. M., (Washington mean time) observations were made. The small circles on the lines indicate the position of the centre of the area of low barometer on the day and report, written in small letters below the line.

































SIGNAL SERVICE CORPS, ARMY.  
DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

PRECIPITATION CHART FOR JANUARY, 1952.

Scale of Shades

Under 2 inches	From 2 to 4 "	4 - 6 "	6 - 8 "	Over 8 "
				
				
				
				
				

[illegible]

PUBLISHED BY ORDER OF THE SECRETARY OF WAR

LTJG. A BVT. MAJ. GEN'L. CHIEF SIGNAL OFFICER, U. S. A.

[illegible]



Ar  
Foro



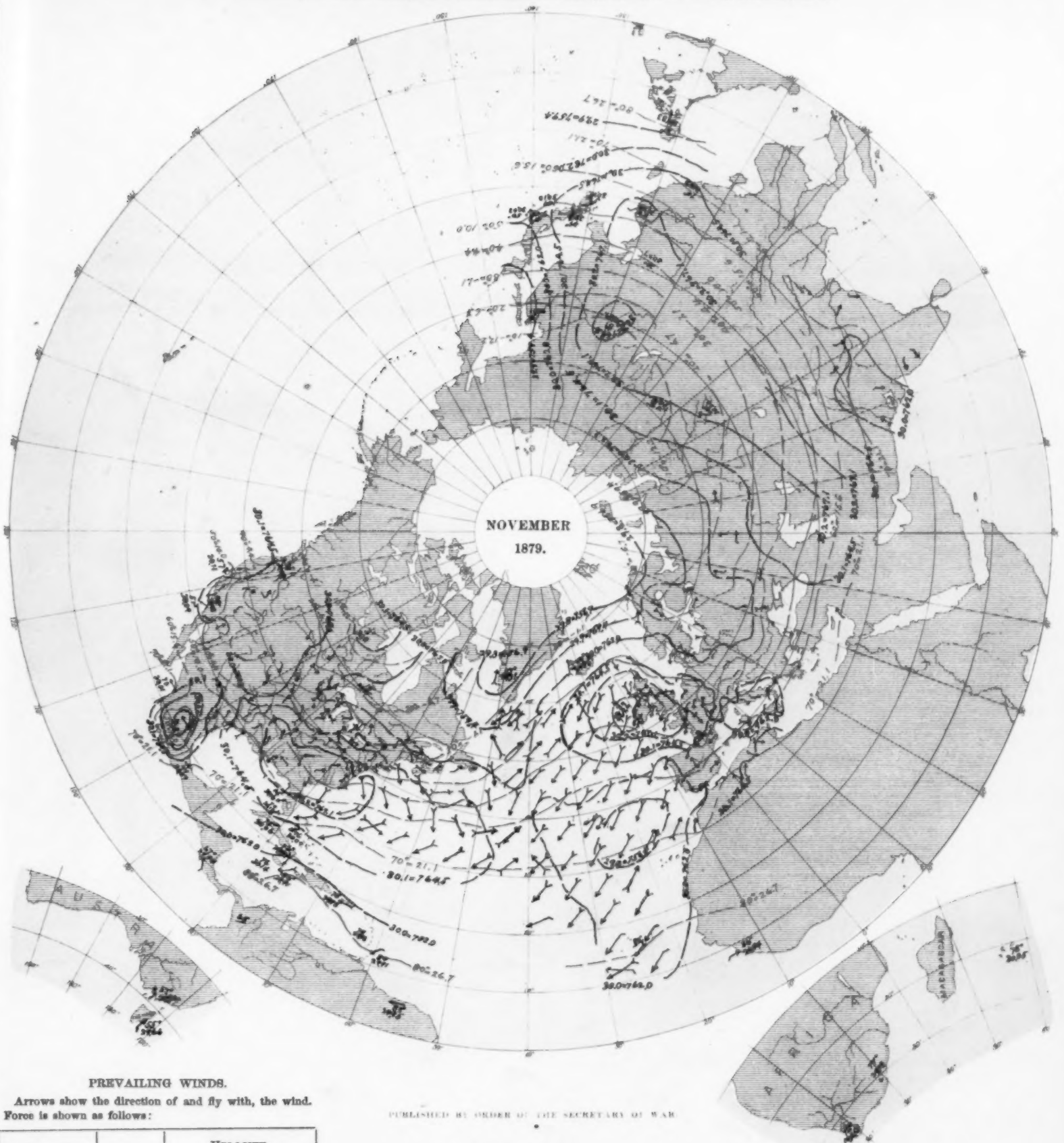


# Office of the Chief Signal Officer,

UNITED STATES ARMY.

Charted from Actual Observations taken Simultaneously, Series commencing January, 1877.

No. IV.



## PREVAILING WINDS.

Arrows show the direction of and fly with, the wind.  
Force is shown as follows:

SYMBOLS.	FORCE.	VELOCITY.	
		Miles per hour.	Metres per second.
○	0	0	0
→	1, 2	0 to 9	0 to 4.0
→→	3, 4	9.1 to 22.5	4.1 to 10.1
→→→	5, 6	22.6 to 40.5	10.1 to 18.1
→→→→	7, 8	40.6 to 67.5	18.1 to 30.2
→→→→→	9, 10	67.6 up.	30.2 & over.

PUBLISHED BY ORDER OF THE SECRETARY OF WAR

*W. B. Bryan*

BRIG. & BVT. MAJ. GEN'L,  
CHIEF SIGNAL OFFICER, U. S. A.

## INTERNATIONAL MONTHLY CHART.

Showing mean pressure, mean temperature, mean force and prevailing direction of winds at 7:35 A. M., Washington mean time, for the month of NOVEMBER 1879, based on the daily charts of the International Bulletin.

## ISOBARS AND ISOTHERMS.

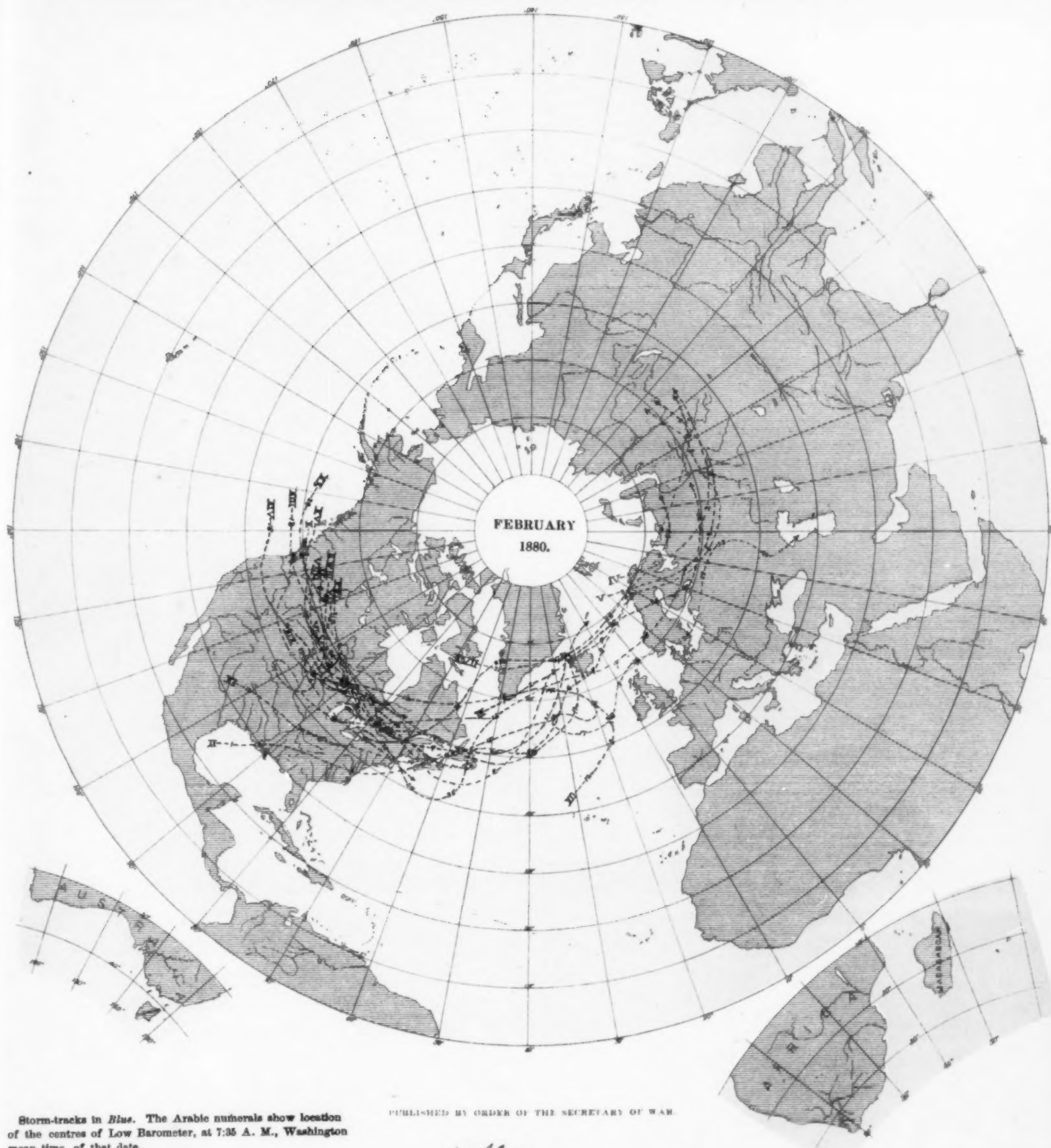
Isobars in blue; detached barometer means in English inches.

Isotherms in red; detached temperature means in degrees Fahrenheit.

Broken lines, are doubtful.







Storm-tracks in Blue. The Arabic numerals show location of the centres of Low Barometer, at 7:35 A. M., Washington mean time, of that date.  
Broken or dotted lines, are doubtful.

PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

*W. H. Bayne*

BRIG. & BVT. MAJ. GEN'L.  
CHIEF SIGNAL OFFICER, U. S. A.

INTERNATIONAL CHART.  
Showing Tracks of Centres of Low Barometer for  
FEBRUARY, 1880.